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[Revised as of January 1, 1964]

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CFR CHECKLIST

1964 Issuances

This checklist, published in the first issue of each month, is arranged in order of titles, and shows the issuance date and price of revised volumes and pocket supplements of the Code of Federal Regulations issued to date during 1964. New units issued during the month are announced in the FEDERAL REGISTER as they become available. Order from Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.

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1030-1059 Rev	1.00
1060-1089 Rev	.75
1090-1119 Rev	.65
1120-1199 Rev	.70
8 Supp	.55
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12 Supp	.50
13 Supp	.40
14 Parts:	
1-19 Rev	2.50
20-199 Rev	1.75
200-399 Rev	1.25
400-end Rev	1.00
15 Rev	1.50
16 Supp	1.00
17 Rev	6.00
18 Supp	.55
19 Rev	1.75
20 Supp	.60
22-23 Supp	.65
24 Supp	.50
25 Supp	.60
26 Parts:	
1 (§§ 1.0-1—1.400) Supp	.65
1 (§§ 1.401—1.860) Supp	1.00
1 (§§ 1.861—end) to 19 Supp	.75
20-29 Supp	.40
30-39 Supp	.40
40-169 Supp	1.00
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600-end Supp	.40
27 Supp	.30
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29 Rev	2.50
30-31 Supp	1.25
32 Parts:	
1-39 Supp	1.25
40-399 Supp	.60
400-589 Supp	.45
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700-799 Supp	.55
800-999 Supp	.70
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1100-end Supp	.60
32A Supp	.70
33-34 Supp	$0.60
35 Supp	.35
36 Supp	.50
37 Supp	.35
38 Rev	2.25
39 Supp	1.00
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44 Supp	.50
45 Supp	.65
46 Parts:	
1-145 Supp	.45
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150-end Supp	1.50
47 Parts:	
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50 Supp	.50
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[1] Special supplement, as of April 1, 1964.

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Chapter VII—Agricultural Stabilization and Conservation Service (Agricultural Adjustment), Department of Agriculture

SUBCHAPTER B—FARM MARKETING QUOTAS AND ACREAGE ALLOTMENTS

PART 728—WHEAT

Subpart—1964–65 Marketing Year

DETERMINATION OF COUNTY NORMAL YIELDS

Correction

In F.R. Doc. 64-4618, appearing at page 6235 of the issue for Tuesday, May 12, 1964, the following entry is inserted in alphabetical order under District 2, South Dakota, in the tabular matter of § 728.8 (d):

*McPherson	15.8

Chapter IX—Agricultural Marketing Service (Marketing Agreements and Orders; Fruits, Vegetables, Tree Nuts), Department of Agriculture

[Nectarine Order 2]

PART 916—NECTARINES GROWN IN CALIFORNIA

Limitation of Shipments

§ 916.315 Nectarine Order 2.

(a) *Findings.* (1) Pursuant to the marketing agreement and Order No. 916 (7 CFR Part 916) regulating the handling of nectarines grown in the State of California, effective under the applicable provisions of the Agricultural Marketing Agreement Act of 1937, as amended (7 U.S.C. 601-674), and upon the basis of the recommendations of the Nectarine Administrative Committee, established under the aforesaid marketing agreement and order, and upon other available information, it is hereby found that the limitation of shipments of nectarines of the variety hereinafter set forth, and in the manner herein provided, will tend to effectuate the declared policy of the act.

(2) It is hereby further found that it is impracticable, unnecessary, and contrary to the public interest to give preliminary notice, engage in public rulemaking procedure, and postpone the effective date of this section until 30 days after publication thereof in the FEDERAL REGISTER (5 U.S.C. 1001-1011) in that, as hereinafter set forth, the time intervening between the date when information upon which this section is based became available and the time when this section must become effective in order to effectuate the declared policy of the act is insufficient; a reasonable time is permitted, under the circumstances, for preparation for such effective time; and good cause exists for making the provisions hereof effective not later than the date hereinafter specified. A reasonable determination as to the supply of, and the demand for, such nectarines must await the development of the crop thereof, and adequate information thereon was not available to the Nectarine Administrative Committee until the date hereinafter set forth on which an open meeting was held, after giving due notice thereof, to consider the need for, and the extent of, regulation of shipments of such nectarines. Interested persons were afforded an opportunity to submit information and views at this meeting; the recommendation and supporting information for regulation during the period specified herein were promptly submitted to the Department after such meeting was held; shipments of the current crop of such nectarines are expected to begin on or about the effective date hereof; this section should be applicable to all such shipments in order to effectuate the declared policy of the act; the provisions of this section are identical with the aforesaid recommendation of the committee; and information concerning such provisions and effective time has been disseminated among handlers of such nectarines and compliance with the provisions of this section will not require of handlers any preparation therefor which cannot be completed by the effective time hereof. Such committee meeting was held on May 21, 1964.

(b) *Order.* (1) During the period beginning at 12:01 a.m., P.s.t., May 30, 1964, and ending at 12:01 a.m., P.s.t., November 1, 1964, no handler shall handle any package or container of Grand River nectarines unless:

(i) Such nectarines, when packed in a standard basket, are of a size not smaller than a size that will pack a 3 x 4 x 5 standard pack; or

(ii) Such nectarines, when packed in any container other than the container specified in subdivision (i) of this subparagraph, measure not less than one and fourteen-sixteenth (1¹⁴⁄₁₆) inches in diameter: *Provided*, That not to exceed ten (10) percent, by count, of the nectarines in any such container may fail to meet such diameter requirement.

(2) When used in this section, "diameter" and "standard pack" shall have the same meaning as set forth in the United States Standards for Nectarines (§§ 51.3145–51.3159 of this title); "standard basket" shall mean the standard basket set forth in paragraph 1 of section 828.1 of the Agricultural Code of California; and all other terms shall have the same meaning as when used in the marketing agreement and order.

(Secs. 1–19, 48 Stat. 31, as amended; 7 U.S.C. 601–674)

Dated: May 27, 1964.

PAUL A. NICHOLSON,
Deputy Director, Fruit and Vegetable Division, Agricultural Marketing Service.

[F.R. Doc. 64–5436; Filed, June 1, 1964; 8:48 a.m.]

[Nectarine Order 4]

PART 916—NECTARINES GROWN IN CALIFORNIA

Limitation of Shipments

§ 916.316 Nectarine Order 4.

(a) *Findings.* (1) Pursuant to the marketing agreement and Order No. 916 (7 CFR Part 916) regulating the handling of nectarines grown in the State of California, effective under the applicable provisions of the Agricultural Marketing Agreement Act of 1937, as amended (7 U.S.C. 601–674), and upon the basis of the recommendations of the Nectarine Administrative Committee, established under the aforesaid marketing agreement and order, and upon other available information, it is hereby found that the limitation of shipments of nectarines of the varieties hereinafter set forth, and in the manner herein provided, will tend to effectuate the declared policy of the act.

(2) It is hereby further found that it is impracticable, unnecessary, and contrary to the public interest to give preliminary notice, engage in public rule-making procedure, and postpone the effective date of this section until 30 days after publication thereof in the FEDERAL REGISTER (5 U.S.C. 1001–1011) in that, as hereinafter set forth, the time intervening between the date when information upon which this section is based became available and the time when this section must become effective in order to effectuate the declared policy of the act is insufficient; a reasonable time is permitted, under the circumstances, for preparation for such effective time; and good cause exists for making the provisions hereof effective not later than the date hereinafter specified. A reasonable determination as to the supply of, and the demand for, such nectarines must await the development of the crop thereof, and adequate information thereon was not available to the Nectarine Administrative Committee until the date hereinafter set forth on which an open meeting was held, after giving due notice thereof, to consider the need for, and the extent of, regulation of shipments of such nectarines. Interested persons were afforded an opportunity to submit information and views at this meeting; the recommendation and supporting information for regulation during the period specified herein were promptly submitted to the Department after such meeting was held; shipments of the current crop of such nectarines are expected to begin on or about the effective date hereof; this section should be applicable to all such shipments in order to effectuate the declared policy of the act; the provisions of this section are identical with the aforesaid recommendation of the committee; and information concerning such provisions and effective time has been disseminated among handlers of such nectarines and compliance with the provisions of this section will not require of handlers any preparation therefor which cannot be completed by the effective time hereof. Such committee meeting was held on May 21, 1964.

(b) *Order.* (1) During the period beginning at 12:01 a.m., P.s.t., May 30, 1964, and ending at 12:01 a.m., P.s.t., November 1, 1964, no handler shall handle any package or container of Sunrise, John River, Early River, Grand Haven, June Grand, or Panamint nectarines unless:

(i) Such nectarines, when packed in a standard basket, are of a size not smaller than a size that will pack a 4 x 4 standard pack;

(ii) Such nectarines, when packed in a No. 26 standard lug box, or in a No. 27 standard lug box, are of a size that will pack, in accordance with the requirements of a standard pack, not more than 108 nectarines in the respective lug box; or

(iii) Such nectarines, when packed in any container other than the containers specified in subdivisions (i) and (ii) of this subparagraph, measure not less than two (2) inches in diameter: *Provided*, That not to exceed ten (10) percent, by count, of the nectarines in any such container may fail to meet such diameter requirement.

(2) When used in this section, "diameter" and "standard pack" shall have the same meaning as set forth in the United States Standards for Nectarines (§§ 51.3145 to 51.3159 of this title); "standard basket" shall mean the standard basket set forth in paragraph 1 of section 828.1 of the Agricultural Code of California; "No. 26 standard lug box" and "No. 27 standard lug box," respectively, shall have the same meaning as set forth in section 828.4 of the Agricultural Code of California, and all other terms shall have the same meaning as when used in the marketing agreement and order.

(Secs. 1–19, 48 Stat. 31, as amended; 7 U.S.C. 601–674)

Dated: May 27, 1964.

PAUL A. NICHOLSON,
Deputy Director, Fruit and Vegetable Division, Agricultural Marketing Service.

[F.R. Doc. 64–5437; Filed, June 1, 1964; 8:48 a.m.]

[Nectarine Order 5]

PART 916—NECTARINES GROWN IN CALIFORNIA

Limitation of Shipments

§ 916.317 Nectarine Order 5.

(a) *Findings.* (1) Pursuant to the marketing agreement and Order No. 916 (7 CFR Part 916) regulating the handling of nectarines grown in the State of California, effective under the applicable provisions of the Agricultural Marketing Agreement Act of 1937, as amended (7 U.S.C. 601–674), and upon the basis of the recommendations of the Nectarine Administrative Committee, established under the aforesaid marketing agreement and order, and upon other available information, it is hereby found that the limitation of shipments of nectarines of the varieties hereinafter set forth, and in the manner herein provided, will tend to effectuate the declared policy of the act.

(2) It is hereby further found that it is impracticable, unnecessary, and contrary to the public interest to give preliminary notice, engage in public rule-making procedure, and postpone the effective date of this section until 30 days after publication thereof in the FEDERAL REGISTER (5 U.S.C. 1001–1011) in that, as hereinafter set forth, the time intervening between the date when information upon which this section is based became available and the time when this section must become effective in order to effectuate the declared policy of the act is insufficient; a reasonable time is permitted, under the circumstances, for preparation for such effective time; and good cause exists for making the provisions hereof effective not later than the date hereinafter specified. A reasonable determination as to the supply of, and the demand for, such nectarines must await the development of the crop thereof, and adequate information thereon was not available to the Nectarine Administrative Committee until the date hereinafter set forth on which an open meeting was held, after giving due notice thereof, to consider the need for, and the extent of, regulation of shipments of such nectarines. Interested persons were afforded an opportunity to submit information and views at this meeting; the recommendation and supporting information for regulation during the period specified herein were promptly submitted to the Department after such meeting was held; shipments of the current crop of such nectarines are expected to begin

on or about the effective date hereof; this section should be applicable to all such shipments in order to effectuate the declared policy of the act; the provisions of this section are identical with the aforesaid recommendation of the committee; and information concerning such provisions and effective time has been disseminated among handlers of such nectarines and compliance with the provisions of this section will not require of handlers any preparation therefor which cannot be completed by the effective time hereof. Such committee meeting was held on May 21, 1964.

(b) *Order.* (1) During the period beginning at 12:01 a.m., P.s.t., June 7, 1964, and ending at 12:01 a.m., P.s.t., November 1, 1964, no handler shall handle any package or container of Princess Quetta, Rose, Early Sun Grand, Sun Grand, Star Grand I, Star Grand II, Red King, Sun Flame, or Grandandy nectarines unless:

(i) Such nectarines, when packed in a No. 26 standard lug box, or in a No. 27 standard lug box, are of a size that will pack, in accordance with the requirements of a standard pack, not more than 96 nectarines in the respective lug box; or

(ii) Such nectarines, when packed in any container other than in a No. 26 standard lug box, or in a No. 27 standard lug box, measure not less than two and one-eighth (2⅛) inches in diameter: *Provided*, That not to exceed ten (10) percent, by count, of the nectarines in any such container may fail to meet such diameter requirement.

(2) When used in this section, "diameter" and "standard pack" shall have the same meaning as set forth in the United States Standards for Nectarines (§§ 51.3145–51.3159 of this title); "standard basket" shall mean the standard basket set forth in paragraph 1 of section 828.1 of the Agricultural Code of California; "No. 26 standard lug box" and "No. 27 standard lug box," respectively, shall have the same meaning as set forth in section 828.4 of the Agricultural Code of California, and all other terms shall have the same meaning as when used in the marketing agreement and order.

(Secs. 1–19, 48 Stat. 31, as amended; 7 U.S.C. 601–674)

Dated: May 27, 1964.

PAUL A. NICHOLSON,
Deputy Director, Fruit and Vegetable Division, Agricultural Marketing Service.

[F.R. Doc. 64-5438; Filed, June 1, 1964; 8:48 a.m.]

[Nectarine Order 6]

PART 916—NECTARINES GROWN IN CALIFORNIA

Limitation of Shipments

§ 916.318 Nectarine Order 6.

(a) *Findings.* (1) Pursuant to the marketing agreement and Order No. 916 (7 CFR Part 916) regulating the handling of nectarines grown in the State of California, effective under the applicable provisions of the Agricultural Marketing Agreement Act of 1937, as amended (7 U.S.C. 601–674), and upon the basis of the recommendations of the Nectarine Administrative Committee, established under the aforesaid marketing agreement and order, and upon other available information, it is hereby found that the limitation of shipments of nectarines of the varieties hereinafter set forth, and in the manner herein provided, will tend to effectuate the declared policy of the act.

(2) It is hereby further found that it is impracticable, unnecessary, and contrary to the public interest to give preliminary notice, engage in public rule making procedure, and postpone the effective date of this section until 30 days after publication thereof in the FEDERAL REGISTER (5 U.S.C. 1001–1011) in that, as hereinafter set forth, the time intervening between the date when information upon which this section is based became available and the time when this section must become effective in order to effectuate the declared policy of the act is insufficient; a reasonable time is permitted, under the circumstances, for preparation for such effective time; and good cause exists for making the provisions hereof effective not later than the date hereinafter specified. A reasonable determination as to the supply of, and the demand for, such nectarines must await the development of the crop thereof, and adequate information thereon was not available to the Nectarine Administrative Committee until the date hereinafter set forth on which an open meeting was held, after giving due notice thereof, to consider the need for, and the extent of, regulation of shipments of such nectarines. Interested persons were afforded an opportunity to submit information and views at this meeting; the recommendation and supporting information for regulation during the period specified herein were promptly submitted to the Department after such meeting was held; shipments of the current crop of such nectarines are expected to begin on or about the effective date hereof; this section should be applicable to all such shipments in order to effectuate the declared policy of the act; the provisions of this section are identical with the aforesaid recommendation of the committee; and information concerning such provisions and effective time has been disseminated among handlers of such nectarines and compliance with the provisions of this section will not require of handlers any preparation therefor which cannot be completed by the effective time hereof. Such committee meeting was held on May 21, 1964.

(b) *Order.* (1) During the period beginning at 12:01 a.m., P.s.t., June 28, 1964, and ending at 12:01 a.m., P.s.t., November 1, 1964, no handler shall handle any package or container of Early Le Grand, Grand Prize, Granderli, Royal Grand, Freedom, Grandeur, Le Grand, Late Le Grand, Golden Grand, Gold King, Red Grand, Marigold, September Grand, or Regal Grand nectarines unless:

(i) Such nectarines, when packed in a No. 26 standard lug box, or in a No. 27 standard lug box, are of a size that will pack, in accordance with the requirements of a standard pack, not more than 88 nectarines in the respective lug box; or

(ii) Such nectarines, when packed in any container other than in a No. 26 standard lug box, or in a No. 27 standard lug box, measure not less than two and one-quarter (2¼) inches in diameter: *Provided*, That not to exceed ten (10) percent, by count, of the nectarines in any such container may fail to meet such diameter requirement.

(2) When used in this section, "diameter" and "standard pack" shall have the same meaning as set forth in the United States Standards for Nectarines (§§ 51.3145–51.3159 of this title); "No. 26 standard lug box" and "No. 27 standard lug box," respectively, shall have the same meaning as set forth in section 828.4 of the Agricultural Code of California, and all other terms shall have the same meaning as when used in the marketing agreement and order.

(Secs. 1–19, 48 Stat. 31, as amended; 7 U.S.C. 601–674)

Dated: May 27, 1964.

PAUL A. NICHOLSON,
Deputy Director, Fruit and Vegetable Division, Agricultural Marketing Service.

[F.R. Doc. 64-5439; Filed, June 1, 1964; 8:48 a.m.]

[Plum Order 4]

PART 917—FRESH BARTLETT PEARS, PLUMS, AND ELBERTA PEACHES GROWN IN CALIFORNIA

Regulation by Size

§ 917.338 Plum Order 4 (Santa Rosa, Formosa, El Dorado).

(a) *Findings.* (1) Pursuant to the marketing agreement, as amended, and Order No. 917, as amended (7 CFR Part 917), regulating the handling of fresh Bartlett pears, plums, and Elberta peaches grown in the State of California, effective under the applicable provisions of the Agricultural Marketing Agreement Act of 1937, as amended (7 U.S.C. 601–674), and upon the basis of the recommendations of the Plum Commodity Committee, established under the aforesaid amended marketing agreement and order, and upon other available information, it is hereby found that the limitation of shipments of plums of the varieties hereinafter set forth, and in the manner herein provided, will tend to effectuate the declared policy of the act.

(2) It is hereby further found that it is impracticable, unnecessary, and contrary to the public interest to give preliminary notice, engage in public rule making procedure, and postpone the effective date of this section until 30 days after publication thereof in the FEDERAL REGISTER (5 U.S.C. 1001–1011) in that, as hereinafter set forth, the time intervening between the date when information upon which this section is based became available and the time when this section must become effective in order to effectuate the declared policy of the act is insufficient; a reasonable time is permitted, under the circumstances, for preparation for such effective time; and good cause exists for making the provisions hereof effective

not later than the date hereinafter specified. A reasonable determination as to the supply of, and the demand for, such plums must await the development of the crop thereof, and adequate information thereon was not available to the Plum Commodity Committee until the date hereinafter set forth on which an open meeting was held, after giving due notice thereof, to consider the need for, and the extent of, regulation of shipments of such plums. Interested persons were afforded an opportunity to submit information and views at this meeting; the recommendation and supporting information for regulation during the period specified herein were promptly submitted to the Department after such meeting was held; shipments of the current crop of such plums are expected to begin on or about the effective date hereof; this section should be applicable to all such shipments in order to effectuate the declared policy of the act; the provisions of this section are identical with the aforesaid recommendation of the committee; and information concerning such provisions and effective time has been disseminated among handlers of such plums; and compliance with the provisions of this section will not require of handlers any preparation therefor which cannot be completed by the effective time hereof. Such committee meeting was held on May 20, 1964.

(b) *Order.* (1) During the period beginning at 12:01 a.m., P.s.t., June 4, 1964, and ending at 12:01 a.m., P.s.t., November 1, 1964, no shipper shall ship any package or container of Santa Rosa, Formosa, or El Dorado plums, unless:

(i) Such plums are of a size that, when packed in a standard basket, they will pack at least a 4 x 5 standard pack; and

(ii) The diameters of the smallest and largest plums in such package or container do not vary more than one-fourth (¼) inch: *Provided,* That a total of not more than five (5) percent, by count, of the plums in the package or container may fail to meet this requirement.

(2) When used herein, "standard pack" shall have the same meaning as set forth in the revised United States Standards for Plums and Prunes (Fresh) (§§ 51.1520–1537 of this title); "standard basket" shall mean the standard basket set forth in paragraph 1 of section 828.1 of the Agricultural Code of California; "diameter" shall mean the distance through the widest portion of the cross section of a plum at right angles to a line running from the stem to the blossom end; and, except as otherwise specified, all other terms shall have the same meaning as when used in the amended marketing agreement and order.

(3) Section 917.143 sets forth the requirements with respect to the inspection and certification of shipments of fruit covered by this section. Such section also prescribes the conditions which must be met if any shipment is to be made without prior inspection and certification. Notwithstanding that shipments may be made without inspection and certification, each shipper shall comply with all grade and size regulations applicable to the respective shipment.

(Secs. 1–19, 48 Stat. 31, as amended; 7 U.S.C. 601–674)

Dated: May 27, 1964.

PAUL A. NICHOLSON,
Deputy Director, Fruit and Vegetable Division, Agricultural Marketing Service.

[F.R. Doc. 64-5440; Filed, June 1, 1964; 8:49 a.m.]

[Plum Order 5]

PART 917—FRESH BARTLETT PEARS, PLUMS, AND ELBERTA PEACHES GROWN IN CALIFORNIA

Regulation by Grade and Size

§ 917.339 Plum Order 5 (Tragedy).

(a) *Findings.* (1) Pursuant to the marketing agreement, as amended, and Order No. 917, as amended (7 CFR Part 917), regulating the handling of fresh Bartlett pears, plums, and Elberta peaches grown in the State of California, effective under the applicable provisions of the Agricultural Marketing Agreement Act of 1937, as amended (7 U.S.C. 601–674), and upon the basis of the recommendations of the Plum Commodity Committee, established under the aforesaid amended marketing agreement and order, and upon other available information, it is hereby found that the limitation of shipments of plums of the variety hereinafter set forth, and in the manner herein provided, will tend to effectuate the declared policy of the act.

(2) It is hereby further found that it is impracticable, unnecessary, and contrary to the public interest to give preliminary notice, engage in public rulemaking procedure, and postpone the effective date of this section until 30 days after publication thereof in the FEDERAL REGISTER (5 U.S.C. 1001–1011) in that, as hereinafter set forth, the time intervening between the date when information upon which this section is based became available and the time when this section must become effective in order to effectuate the declared policy of the act is insufficient; a reasonable time is permitted, under the circumstances, for preparation for such effective time; and good cause exists for making the provisions hereof effective not later than the date hereinafter specified. A reasonable determination as to the supply of, and the demand for, such plums must await the development of the crop thereof, and adequate information thereon was not available to the Plum Commodity Committee until the date hereinafter set forth on which an open meeting was held, after giving due notice thereof, to consider the need for, and the extent of, regulation of shipments of such plums. Interested persons were afforded an opportunity to submit information and views at this meeting; the recommendation and supporting information for regulation during the period specified herein were promptly submitted to the Department after such meeting was held; shipments of the current crop of such plums are expected to begin on or about the effective date hereof; this section should be applicable to all such shipments in order to effectuate the declared policy of the act; the provisions of this section are identical with the aforesaid recommendation of the committee; and information concerning such provisions and effective time has been disseminated among handlers of such plums and compliance with the provisions of this section will not require of handlers any preparation therefor which cannot be completed by the effective time hereof. Such committee meeting was held on May 20, 1964.

(b) *Order.* (1) The provisions of § 917.335 (Plum Order 1; 29 F.R. 6615) shall not apply to Tragedy plums during the period specified in subparagraph (2) of this paragraph.

(2) During the period beginning at 12:01 a.m., P.s.t., June 15, 1964, and ending at 12:01 a.m., P.s.t., November 1, 1964, no shipper shall ship any package or container of Tragedy plums, unless:

(i) Such plums grade at least U.S. No. 1, with a total tolerance of ten (10) percent for defects not considered serious damage in addition to the tolerances permitted by such grade;

(ii) Such plums are of a size that, when packed in a standard basket, they will pack at least a 5 x 6 standard pack; and

(iii) The diameters of the smallest and largest plums in such package or container do not vary more than one-fourth (¼) inch: *Provided,* That a total of not more than five (5) percent, by count, of the plums in the package or container may fail to meet this requirement.

(3) When used herein, "standard pack" and "serious damage" shall have the same meaning as set forth in the revised United States Standards for Plums and Prunes (Fresh) (§§ 51.1520–51.1537 of this title); "standard basket" shall mean the standard basket set forth in paragraph 1 of section 828.1 of the Agricultural Code of California; "diameter" shall mean the distance through the widest portion of the cross section of a plum at right angles to a line running from the stem to the blossom end; and, except as otherwise specified, all other terms shall have the same meaning as when used in the amended marketing agreement and order.

(4) Section 917.143 sets forth the requirements with respect to the inspection and certification of shipments of fruit covered by this section. Such section also prescribes the conditions which must be met if any shipment is to be made without prior inspection and certification. Notwithstanding that shipments may be made without inspection and certification, each shipper shall comply with all grade and size regulations applicable to the respective shipment.

(Secs. 1–19, 48 Stat. 31, as amended; 7 U.S.C. 601–674)

Dated: May 27, 1964.

PAUL A. NICHOLSON,
Deputy Director, Fruit and Vegetable Division, Agricultural Marketing Service.

[F.R. Doc. 64-5441; Filed, June 1, 1964; 8:49 a.m.]

[Plum Order 6]

PART 917—FRESH BARTLETT PEARS, PLUMS, AND ELBERTA PEACHES GROWN IN CALIFORNIA

Regulation by Size

§ 917.340 Plum Order 6 (Wickson).

(a) *Findings.* (1) Pursuant to the marketing agreement, as amended, and Order No. 917, as amended (7 CFR Part 917), regulating the handling of fresh Bartlett pears, plums, and Elberta peaches grown in the State of California, effective under the applicable provisions of the Agricultural Marketing Agreement Act of 1937, as amended (7 U.S.C. 601–674), and upon the basis of the recommendations of the Plum Commodity Committee, established under the aforesaid amended marketing agreement and order, and upon other available information, it is hereby found that the limitation of shipments of plums of the variety hereinafter set forth, and in the manner herein provided, will tend to effectuate the declared policy of the act.

(2) It is hereby further found that it is impracticable, unnecessary, and contrary to the public interest to give preliminary notice, engage in public rulemaking procedure, and postpone the effective date of this section until 30 days after publication thereof in the FEDERAL REGISTER (5 U.S.C. 1001–1011) in that, as hereinafter set forth, the time intervening between the date when information upon which this section is based became available and the time when this section must become effective in order to effectuate the declared policy of the act is insufficient; a reasonable time is permitted, under the circumstances, for preparation for such effective time; and good cause exists for making the provisions hereof effective not later than the date hereinafter specified. A reasonable determination as to the supply of, and the demand for, such plums must await the development of the crop thereof, and adequate information thereon was not available to the Plum Commodity Committee until the date hereinafter set forth on which an open meeting was held, after giving due notice thereof, to consider the need for, and the extent of, regulation of shipments of such plums. Interested persons were afforded an opportunity to submit information and views at this meeting; the recommendation and supporting information for regulation during the period specified herein were promptly submitted to the Department after such meeting was held; shipments of the current crop of such plums are expected to begin on or about the effective date hereof; this section should be applicable to all such shipments in order to effectuate the declared policy of the act; the provisions of this section are identical with the aforesaid recommendation of the committee; and information concerning such provisions and effective time has been disseminated among handlers of such plums and compliance with the provisions of this section will not require of handlers any preparation therefor which cannot be completed by the effective time hereof. Such committee meeting was held on May 20, 1964.

(b) *Order.* (1) During the period beginning at 12:01 a.m., P.s.t., June 15, 1964, and ending at 12:01 a.m., P.s.t., November 1, 1964, no shipper shall ship any package or container of Wickson plums, unless:

(i) Such plums are of a size that, when packed in a standard basket, they will pack at least a 4 x 4 standard pack; and

(ii) The diameters of the smallest and largest plums in such package or container do not vary more than one-fourth (¼) inch: *Provided,* That a total of not more than five (5) percent, by count, of the plums in the package or container may fail to meet this requirement.

(2) When used herein, "standard pack" shall have the same meaning as set forth in the revised United States Standards for Plums and Prunes (Fresh) (§§ 51.1520–51.1537 of this title); "standard basket" shall mean the standard basket set forth in paragraph 1 of section 828.1 of the Agricultural Code of California; "diameter" shall mean the distance through the widest portion of the cross section of a plum at right angles to a line running from the stem to the blossom end; and, except as otherwise specified, all other terms shall have the same meaning as when used in the amended marketing agreement and order.

(3) Section 917.143 sets forth the requirements with respect to the inspection and certification of shipments of fruit covered by this section. Such section also prescribes the conditions which must be met if any shipment is to be made without prior inspection and certification. Notwithstanding that shipments may be made without inspection and certification, each shipper shall comply with all grade and size regulations applicable to the respective shipment.

(Secs. 1–19, 48 Stat. 31, as amended; 7 U.S.C. 601–674)

Dated: May 27, 1964.

PAUL A. NICHOLSON,
Deputy Director, Fruit and Vegetable Division, Agricultural Marketing Service.

[F.R. Doc. 64–5442; Filed, June 1, 1964; 8:49 a.m.]

[965.306, Amdt. 1]

PART 965—TOMATOES GROWN IN LOWER RIO GRANDE VALLEY IN TEXAS

Limitation of Shipments

Findings. (a) Pursuant to Marketing Order No. 965 (7 CFR Part 965), regulating the handling of tomatoes grown in the counties of Cameron, Hidalgo, Starr, and Willacy in Texas (Lower Rio Grande Valley), effective under the applicable provisions of the Agricultural Marketing Agreement Act of 1937, as amended (7 U.S.C. 601 et seq.), and upon the basis of recommendations and information submitted by the Texas Valley Tomato Committee, established pursuant to the said marketing order, and other available information, it is hereby found that the amendment to the limitation of shipments regulations, hereinafter set forth, will tend to effectuate the declared policy of the act.

(b) It is hereby found that it is impracticable and contrary to the public interest to give preliminary notice, or engage in public rule making procedure, and that good cause exists for not postponing the effective date of this amendment until 30 days after publication in the FEDERAL REGISTER (5 U.S.C. 1003) in that (1) the time intervening between the date when information upon which this regulation is based became available and the time when this amendment must become effective in order to effectuate the declared policy of the act is insufficient since the marketing season of the 1963–64 Lower Valley tomato crop has begun, (2) regulations have been issued under the order since 1959, so compliance with this regulation will not require any special preparation on the part of handlers, (3) information regarding the committee's recommendation has been made available to producers and handlers in the production area, and (4) this amendment relieves restrictions on the handling of tomatoes grown in the production area.

Order, as amended. Paragraphs (a) and (g) of § 965.306 (29 F.R. 5636) are amended to read as follows:

§ 965.306 Limitation of shipments.

* * * * *

(a) *Requirements*—(1) *Minimum grade.* (i) From May 29, 1964, through June 7, 1964, U.S. No. 3, or better, grade.

(ii) From June 8 through July 15, 1964, U.S. No. 2, or better, grade.

* * * * *

(g) *Definitions*—(1) *Grade, size, and color.* The terms "U.S. No. 2," "U.S. No. 3," "green," and "breakers" mean the U.S. No. 2 grade, U.S. No. 3 grade, and "green" and "breakers" maturity, as set forth in the United States Standards for Fresh Tomatoes (§§ 51.1855–51.1877 of this title; 22 F.R. 4528 as amended, 26 F.R. 8559), including the tolerance set forth therein; and the application for tolerance for size shall be as set forth in § 51.1861 of such standards. Other terms used in this section shall have the same meaning as when used in Marketing Order No. 965 (7 CFR Part 965).

* * * * *

(Secs. 1–19, 48 Stat. 31, as amended; 7 U.S.C. 601 et seq.)

Dated May 28, 1964, to become effective May 29, 1964.

PAUL A. NICHOLSON,
Deputy Director,
Fruit and Vegetable Division.

[F.R. Doc. 64–5503; Filed, June 1, 1964; 8:49 a.m.]

[980.202 Amdt. 1]

PART 980—VEGETABLES; IMPORT REGULATIONS

Tomatoes

Pursuant to the requirement contained in section 608e of the Agricultural Marketing Agreement Act of 1937, as amended (secs. 1–19, 48 Stat. 31, as amended; 7 U.S.C. 601 et seq.), § 980.202 *Tomato Import Regulation No. 9* (29 F.R. 6001), is hereby amended as set forth below.

Order, as amended. Amend paragraphs (a)(1) and (g)(1) in § 980.202 *Tomato Import Regulation No. 9*, to read as follows:

§ 980.202 Tomtato Import Regulation No. 9.

* * * * *

(a) *Minimum grade and size requirements*—(1) *Grade.* (i) From May 29, 1964, through June 7, 1964, U.S. No. 3, or better, grade.

(ii) From June 8, 1964, through July 15, 1964, U.S. No. 2, or better, grade.

* * * * *

(g) *Definitions.* (1) The terms "U.S. No. 3" and "U.S. No. 2" mean the U.S. No. 3 and U.S. No. 2 grades as set forth in the United States Standards for Fresh Tomatoes (§§ 51.1855 to 51.1877, inclusive, of this title), including the tolerances set forth therein.

* * * * *

This amendment accords with simultaneous amendment to the limitation of shipments regulation effective on domestic shipments of tomatoes (§ 965.306, Amdt. No. 1) under Marketing Order No. 965 (7 CFR Part 965), regulating the handling of tomatoes grown in the Lower Rio Grande Valley in Texas, and relieves restrictions on the importation of tomatoes from the effective date hereof through June 7, 1964. Accordingly notice of rule making and publication procedure hereon are unnecessary and impractical and there is no reason to postpone the effective date beyond May 29, 1964 (5 U.S.C. 1003).

(Secs. 1–19, 48 Stat. 31, as amended; 7 U.S.C. 601 et seq.)

Dated May 28, 1964, to become effective May 29, 1964.

PAUL A. NICHOLSON,
Deputy Director,
Fruit and Vegetable Division.

[F.R. Doc. 64–5504; Filed, June 1, 1964; 8:49 a.m.]

Title 13—BUSINESS CREDIT AND ASSISTANCE

Chapter I—Small Business Administration

[Amdt. 7 (Rev. 2)]

PART 107—SMALL BUSINESS INVESTMENT COMPANIES

Miscellaneous Amendments

Pursuant to authority contained in section 308 of the Small Business Investment Act of 1958, Public Law 85–699, 72 Stat. 694, as amended, there is amended, as set forth below, §§ 107.402, 107.718, 107.1007, 107.1008, and 107.1009 of Part 107 of Subchapter B, Chapter I of Title 13 of the Code of Federal Regulations, as revised in 27 F.R. 9743–9754 and amended in 28 F.R. 681, 1627, 3021, 10868, 12250, and 29 F.R. 5223.

Information and effective date. Subject amendments authorize a longer term for loans made by SBA to licensed small business investment companies under section 303 of the Act, and require Licensee companies to report to SBA any litigation to which they have become parties. They also clarify and confirm, by official interpretations incorporated as part of the regulations, that paid-in capital and paid-in surplus derived from accumulated unappropriated retained earnings, which have been appropriately capitalized through the issuance of a stock dividend, may be used as the basis for obtaining SBA funds under sections 302 and 303 of the Act; that where funds received by a Licensee company in exchange for subordinated debentures pursuant to section 302 of the Act exceed the statutory limit as a result of a merger subsequently consummated with another company, the resultant Licensee will be accorded a reasonable period of time in which to repay the excessive debenture amount or, in lieu thereof, may convert such amount into a section 303 loan for which it may otherwise be eligible under § 107.402 of the regulations; and that a Licensee company which proposes to surrender its license, and submits for SBA approval its plan of dissolution, must make pro rata distribution to its stockholders and cannot transfer its assets to another corporation which is not, and does not propose to become, a licensed small business investment company.

Section 107.402(c) of the Regulations provides that the maturities of SBA loans to small business investment companies under section 303 of the Act shall not exceed 20 years. According to SBA's practice to date, such loans have been made with a maturity date of 5 years. As set forth below, § 107.402(c) is being amended to provide that all such loans shall be for a term of 6 years renewable, at SBA's discretion, for an additional period of 4 years. In the event of such renewal, the unpaid principal balance will be amortized at a rate of 33⅓ percent per annum during the eighth, ninth, and tenth years, respectively.

As set forth below, subject amendments add a new § 107.718 which requires Licensee companies to file, within 10 days of becoming a party to litigation or other proceedings, a report with SBA describing the nature and status of the proceedings, and the identity of and the Licensee's relationship to other parties involved. Upon SBA's request, the Licensee must also submit copies of the pleadings and other documents specified by SBA.

Subject amendments add a new § 107.1007 interpreting § 107.301 and 107.402 of the Regulations dealing with a Licensee's eligibility for funds under section 302 and section 303 of the Act. The new section states that a Licensee may increase its paid-in capital and paid-in suplus by capitalizing accumulated unappropriated retained earnings through the issuance of a stock dividend, and that the amount by which paid-in capital and paid-in surplus is thus increased may be used for the purpose of determining the amount of subordinated debentures which SBA may purchase under § 107.301 and the aggregate amount of loan funds which SBA may advance it under § 107.402 of the regulations. The per share value of the stock dividend issued to capitalize such retained earnings must not be less than the average paid-in capital per share at the time the stock dividend is declared (par or stated value of capital stock issued plus paid-in surplus divided by the number of shares of capital stock issued).

Subject amendments add a new § 107.1008 interpreting § 107.301 dealing with the maximum amount of SBA funds for which a Licensee company may be eligible under section 302 of the Act, and interpreting § 107.302(a)(7) of the regulations pertaining to mergers to which a Licensee company is a party. The new section states that if following such a merger or consolidation the resultant Licensee company has outstanding subordinated debentures in excess of its statutory maximum, it must repay the excessive debenture amount within a reasonable period of time or, in lieu thereof, it may apply for permission to convert such amount into a section 303 loan for which it may otherwise be eligible under § 107.402 of the regulations.

Subject amendments add a new § 107.1009 interpreting § 107.205 of the Regulations concerning voluntary surrender by a small business investment company of its license and SBA approval of its plan of dissolution. The new section confirms that the plan of dissolution must provide for pro rata distribution to the common shareholders after satisfaction of prior claims of senior securities, and that the Licensee company may not transfer its assets to a non-Licensee company or exchange them for the securities of a corporation which is not, and does not propose to become, a licensed small business investment company. Failure of the applicant Licensee company to submit to SBA all agreements and understandings, express or implied, relative to the plan of dissolution and the surrender of its license will render any previously granted SBA approval void on the ground that it was not obtained in conformity with the applicable regulatory provisions of § 107.205.

Since the amendment of § 107.402(c) amounts to a relaxation of existing provisions thereof pertaining to the term of section 303 loans, and since the newly added §§ 107.1007, 107.1008, and 107.1009 merely interpret the existing provisions of §§ 107.301 and 107.402, §§ 107.301 and 107.302(a)(7), and § 107.205, respectively, of the Regulations and are, therefore, exempt from the rule-making requirements of the Administrative Procedure Act (5 U.S.C. 1003), and because of the necessity of promptly applying the amendment incorporating new § 107.718 as well as the other amendments to the program authorized under the Small Business Investment Act of 1958, they shall become effective upon publication in the FEDERAL REGISTER.

The Regulations Governing Small Business Investment Companies are hereby further amended by:

1. Deleting § 107.402(c) in its entirety and substituting a new § 107.402(c) which reads as follows:

§ 107.402 SBA operating loans to Licensees under Section 303 of the Act.

* * * * *

(c) Such loans may be prepaid at any time without penalty. Interest upon such loans shall be at the rate of 5 percent per annum and the maturity thereof shall be for a term of 6 years: *Provided, however,* That (1) SBA in its discretion may renew such loans for an additional period of 4 years and (2) in such event, the unpaid principal balance shall be repaid at a rate of 33⅓ percent per annum during each of the last three years of the extended term, i.e., during the eighth, ninth, and tenth years, respectively. Any such loan or loans made pursuant to this section shall contain such further terms and conditions as shall be determined by SBA.

2. Adding a new § 107.718 which reads as follows:

§ 107.718 Reporting litigation to which Licensee is a party.

Every Licensee which is a party in any capacity to litigation or other proceedings, including any action by the Licensee or a security holder thereof in a derivative capacity against an officer, director, investment adviser or trustee of such Licensee for alleged breach of official duty, shall within 10 days of becoming a party thereto file a report with SBA describing the nature and status of the proceedings, the identity of and Licensee's relationship to other parties involved and, upon SBA's request, submit copies of the pleadings and other documents specified by it. In case such proceedings have been compromised or settled or final judgment has been entered on the merits, the Licensee shall furnish SBA with a statement of the terms of such settlement or compromise, or describing the final judgment entered.

3. Adding a new § 107.1007 which reads as follows:

§ 107.1007 Capitalizing retained earnings to increase paid-in capital and paid-in surplus and qualification for SBA funds under Section 302 and Section 303 of the Act (interpreting § 107.301 and § 107.402).

(a) A Licensee may increase its paid-in capital and paid-in surplus by capitalizing accumulated unappropriated retained earnings (i.e., up to but not exceeding retained earnings from operations and retained earnings from realized gains on investments) through the issuance of a stock dividend: *Provided, however,* That the stock dividend is issued in accordance with the following generally accepted principle, namely, the per share value of the stock dividend issued to capitalize accumulated unappropriated retained earnings shall be not less than the average paid-in capital per share existing at the time that the dividend is declared (par or stated value of capital stock issued plus paid-in surplus divided by the number of shares of capital stock issued).

(b) The amount by which paid-in capital and paid-in surplus is thus increased incident to the stock dividend may be properly included in the Licensee's total paid-in capital and paid-in surplus. Such total paid-in capital and paid-in surplus may be used for the purpose of determining the amount of subordinated debentures which SBA may purchase from such Licensee under § 107.301 and the aggregate amount of loan funds which SBA may advance to such Licensee under § 107.402.

4. Adding a new § 107.1008 which reads as follows:

§ 107.1008 Section 302 funds in excess of statutory maximum held by Licensee as a result of a merger (interpreting §§ 107.301 and 107.302(a)(7)).

(a) Section 302(a) of the Small Business Investment Act of 1958 provides that SBA may purchase subordinated debentures from an SBIC "in an amount not to exceed the lesser of $700,000 or the amount of the paid-in capital and surplus of the company from other sources." A problem has arisen under this provision where Licensee parties to a merger, subject to SBA prior approval, in the aggregate have outstanding subordinated debentures in excess of the statutory maximum. If the merger is consummated without revision of the constituent capital accounts, the resultant SBIC will hold excessive 302 funds. Consequently, the capital position of the Licensee would not be in conformity with the statutory directive.

(b) Accordingly, the excessive debenture amount must be rapid to SBA within a reasonable period of time. The Licensee will be accorded a full opportunity to demonstrate by appropriate evidence what should be considered a reasonable period in which to effect repayment under the particular circumstances involved. Pending repayment, the excessive debenture amount cannot be considered capital for any purposes of the Act.

(c) In lieu of the foregoing procedure, the Licensee may apply to SBA for permission to convert the excessive debenture amount into a section 303 loan for which it may otherwise be eligible under § 107.402.

5. Adding a new § 107.1009 which reads as follows:

§ 107.1009 Dissolution in connection with surrender of license (interpreting § 107.205).

(a) Under § 107.205, an SBIC desiring to surrender its license must first furnish a plan of dissolution to SBA. This plan must include provisions for the liquidation of the Licensee's assets and their pro rata distribution to the common stockholders after satisfaction of the prior claims of senior securities, if any. Section 107.205 requires the submission to SBA of all agreements and understandings, express or implied, relative to the plan of dissolution and surrender of the license. Failure to do so will render any previously granted SBA approval void on the ground that it was not obtained in conformity with the applicable regulatory provisions.

(b) Section 107.205 contemplates the liquidation of the Licensee's assets and their distribution to its shareholders rather than their exchange for the securities of a corporation which is not, and does not propose to become, a licensed small business investment company. Consequently, any dissolution plan filed pursuant to § 107.205 that provides for the exchange of the Licensee's assets for the securities of such a corporation, either directly by the Licensee or indirectly by the Licensee's shareholders acting in concert, will not be approved by SBA. If the exchange is made pursuant to a prearranged agreement to act in concert, entered into without the consent of SBA and not submitted as part of the plan of dissolution, the previously granted SBA approval of such plan shall be deemed void.

Dated: May 26, 1964.

Eugene P. Foley,
Administrator.

[F.R. Doc. 64-5423; Filed, May 27, 1964; 3:48 p.m.]

Title 14—AERONAUTICS AND SPACE

Chapter I—Federal Aviation Agency

SUBCHAPTER E—AIRSPACE [NEW]

[Airspace Docket No. 64-WA-35]

PART 71—DESIGNATION OF FEDERAL AIRWAYS, CONTROLLED AIRSPACE, AND REPORTING POINTS [NEW]

Alteration of Federal Airway

The purpose of this amendment to Part 71 [New] of the Federal Aviation Regulations is to realign the terminating segment of VOR Federal airway No. 216 which is designated from Peck, Mich., to Toronto, Ontario, Canada.

The Canadian Department of Transport has installed a new VOR navigational facility near Kleinburg, Ontario (latitude 43°56′07″ N., longitude 79°40′11″ W.). Action is taken herein to realign within the United States V-216 from Peck direct to the Kleinburg VOR. This airway realignment requested by the Canadian Department of Transport will provide for transborder air traffic to adhere to the revised traffic flow procedures for the Toronto, Ontario, terminal area.

Since this action is minor in nature and imposes no additional burden on any person, notice and public procedure hereon are unnecessary. However, since it is necessary that sufficient time be allowed to permit appropriate changes to be made on aeronautical charts, this amendment will become effective more than 30 days after publication.

In consideration of the foregoing, § 71.123 (29 F.R. 1009, 3356) is amended as follows: In V-216 "to Toronto, Ontario, Canada." is deleted and "to Kleinburg, Ontario, Canada" is substituted therefor.

This amendment shall become effective 0001 e.s.t., July 2, 1964.

(Sec. 307(a), 72 Stat. 749; 49 U.S.C. 1348)

Issued in Washington, D.C., on May 27, 1964.

H. B. Helstrom,
Acting Chief, Airspace Regulations and Procedures Division.

[F.R. Doc. 64-5444; Filed, June 1, 1964; 8:49 a.m.]

[Airspace Docket No. 64-WA-36]

PART 71—DESIGNATION OF FEDERAL AIRWAYS, CONTROLLED AIRSPACE, AND REPORTING POINTS [NEW]

Revocation of Federal Airway Segment

The purpose of this amendment to Part 71 [New] of the Federal Aviation Regulations is to revoke the United States segment of VOR Federal airway No. 300 north alternate from St. Johns, Quebec, Canada, to Millinocket, Maine.

The Canadian Department of Transport plans to delete the Canadian portion of V-300 north alternate segment effective July 2, 1964. Accordingly, the retention of the United States portion of this airway segment would serve little or no useful purpose as the airway was originally designated at the request of the Canadian Government. Therefore, action is taken herein to revoke the United States portion of V-300 north alternate from St. Johns, Quebec, to Millinocket, Maine.

Since this amendment is minor in nature and imposes no additional burden on any person, compliance with section 4 of the Administrative Procedure Act is unnecessary.

In consideration of the foregoing, § 71.123 (29 F.R. 1009) is amended as follows: In V-300 ", including an N alternate from St. Johns, Quebec, Canada, to Millinocket via INT of St. Johns 071° and Millinocket 279° radials" is deleted.

This amendment shall become effective 0001 e.s.t., July 2, 1964.

(Sec. 307(a), 72 Stat. 749; 49 U.S.C. 1348)

Issued in Washington, D.C., on May 27, 1964.

H. B. Helstrom,
Acting Chief, Airspace Regulations and Procedures Division.

[F.R. Doc. 64-5445; Filed, June 1, 1964; 8:49 a.m.]

[Airspace Docket No. 64-SW-19]

PART 71—DESIGNATION OF FEDERAL AIRWAYS, CONTROLLED AIRSPACE, AND REPORTING POINTS [NEW]

Alteration of Control Zone

The purpose of this amendment to Part 71 [New] of the Federal Aviation Regulations is to alter the description of the New Orleans International Airport-Moisant Field control zone. The New Orleans RBN is being relocated to the International Airport-Moisant Field LOM site (latitude 30°01'30" N., longitude 90°23'58" W.). This relocation will result in the cancellation of two approaches to this airport for which two control zone extensions are presently designated. Therefore this action amends the description of the control zone by revoking the extensions based on the 093° and 072° bearings from the RBN, and redesignating the outer marker as a compass locator at the outer marker.

Since this amendment imposes no additional burden on any person, notice and public procedure hereon are unnecessary and the amendment may be made effective without regard to the 30-day statutory period preceding effectiveness. However, in order to provide sufficient time for charting purposes, this amendment will become effective more than 30 days after publication.

In consideration of the foregoing, Part 71 [New] of the Federal Aviation Regulations is amended, effective July 23, 1964, as hereinafter set forth.

In § 71.171 (29 F.R. 1101) the New Orleans, La., International Airport-Moisant Field control zone is amended to read as follows:

New Orleans, La. (New Orleans International Airport-Moisant Field).

Within a 5-mile radius of New Orleans International Airport (latitude 29°59'25" N., longitude 90°15'15" W.); within 2 miles each side of the New Orleans ILS localizer W course extending from the 5-mile radius zone to 2 miles E of the LOM; within 2 miles each side of the New Orleans VORTAC 085° radial extending from the VORTAC to 7 miles E; within 2 miles each side of the New Orleans VORTAC 243° and 063° radials extending from the 5-mile radius zone to 1 mile NE of the VORTAC, excluding that portion E of longitude 90°04'03" W.

(Sec. 307(a) of the Federal Aviation Act of 1958; 49 U.S.C. 1348)

Issued in Washington, D.C., on May 22, 1964.

H. B. Helstrom,
Acting Chief, Airspace Regulations and Procedures Division.

[F.R. Doc. 64-5410; Filed, June 1, 1964; 8:45 a.m.]

[Airspace Docket No. 62-PC-20]

PART 71—DESIGNATION OF FEDERAL AIRWAYS, CONTROLLED AIRSPACE, AND REPORTING POINTS [NEW]

Alteration of Control Zone; Correction

On April 7, 1964, Federal Register Document 64-3332 was published in the Federal Register (29 F.R. 4854) and amended §§ 71.171, 71.165, and 71.181 of the Federal Aviation Regulations. The second amendment to § 71.171 contains reference to the Talofofo RBN in describing the Guam Island (NAS Agana) control zone. The name of this facility has been changed to "Guam RBN." Therefore, action is taken herein to reflect this change in the control zone description.

Since this amendment is editorial in nature and imposes no additional burden on any person, notice and public procedure hereon are unnecessary, and the effective date of the final rule as initially adopted may be retained.

In consideration of the foregoing, effective immediately, Federal Register Document 64-3332 (29 F.R. 4854) is amended as follows: In Item No. 2, the Guam Island (NAS Agana) control zone, delete "Talofofo, Guam Island RBN 026° bearing," and substitute "Guam RBN 026° bearing," therefor.

(Secs. 307(a), 1110, 49 U.S.C. 1348, 1510, E.O. 10854, 24 F.R. 9565)

Issued in Washington, D.C., on May 22, 1964.

H. B. Helstrom,
Acting Chief, Airspace Regulations and Procedures Division.

[F.R. Doc. 64-5411; Filed, June 1, 1964; 8:45 a.m.]

SUBCHAPTER F—AIR TRAFFIC AND GENERAL OPERATING RULES [NEW]

[Docket No. 6007, Amdt. 99-1]

PART 99—SECURITY CONTROL OF AIR TRAFFIC [NEW]

Panama Canal Zone Domestic ADIZ

This amendment of Part 99 of the Federal Aviation Regulations establishes an Air Defense Identification Zone over the Panama Canal Zone to require position reports and flight plans from pilots operating civil aircraft into or within the ADIZ.

The airspace above the Canal Zone is currently designated as the "Canal Zone Military Airspace Reservation" by § 5.2 of the Panama Canal Air Navigation Regulations, 35 CFR 5.2. This section and the associated Air Navigation Regulations of Part 5 of Title 35 are promulgated by the Secretary of the Army under authority delegated by the President in accordance with the Canal Zone Code, section 701, 76A Stat. 29, 700. This authority was reserved to the President by section 101(29) of the Federal Aviation Act, 49 U.S.C. 1301.

The Military Airspace Reservation extends from the surface of the Canal Zone upward without ceiling. Transient aircraft may not be operated within the reservation without the permission of the Commander in Chief, U.S. Southern Command. In addition to the reservation, which is charted as R-600, there are numerous danger areas designated over the canal and the waters at each end of the canal, both within and outside the 3-mile marine boundary. The effect of the airspace reservation is to prevent the operation into or through the zone of all aircraft except U.S. military aircraft and aircraft of certain duly organized civil air clubs. Landings of other aircraft are permitted if an emergency exists.

Discussions between representatives of the Department of Defense and this Agency have resulted in the formation of a plan to improve the flow of air traffic in the regional area which encompasses the Canal Zone. This plan provides for the installation and operation of a VORTAC and a high-power, low-frequency radio beacon at each end of the zone; an airport surveillance radar, and a long-range radar; the modification of the airspace restrictions over the zone and the adjacent oceanic areas; revision of the air-route structure; and the establishment of this Air Defense Identification Zone with associated facilities.

The ADIZ established herein extends upward from 2,500 feet MSL. Concurrently with the effective date of this amendment, military action will reduce R-600 by the imposition of a ceiling at 2,500 feet above mean sea level. At the same time, the danger areas over the canal, including those within the 3-mile limit, will be reestablished by the military as "restricted areas" or rescinded as being no longer necessary. It might be noted that these restricted areas are not being established by this Agency in Part 73 of the Federal Aviation Regulations and, consequently, do not fall within the definition of that term as used in the Federal Aviation Regulations. All restricted areas will be designated joint use airspace with the Panama Air Route Traffic Control Center acting as the controlling agency. The danger areas existing beyond the 3-mile limit will be modified and renamed in nonrule making actions by this Agency as warning areas.

Inasmuch as the overall effect of these regulatory actions will lessen a burden on the public, I find it contrary to the public interest to comply with the notice and public procedure requirements of the Administrative Procedure Act. Compliance with the effective date provision of the Act will be met in that this amendment is made effective July 1, 1964.

In consideration of the foregoing, Part 99 of the Federal Aviation Regulations is hereby amended as follows:

By adding a new § 99.43(c) to read as follows:

(c) *Panama Canal Zone Domestic ADIZ.* The Canal Zone, including the territorial waters within the 3-mile marine boundary at each end of the canal, beginning at 2,500 feet MSL and extending upward.

This amendment shall become effective at 0001 e.s.t. (0501Z) on July 1, 1964.

(Secs. 307, 1201, 1202 of the Federal Aviation Act of 1958, 72 Stat. 749, 800, 49 U.S.C. 1348, 1510, 1522)

Issued in Washington, D.C., on May 27, 1964.

N. E. HALABY,
Administrator.

[F.R. Doc. 64-5450; Filed, June 1, 1964; 8:49 a.m.]

Title 16—COMMERCIAL PRACTICES

Chapter I—Federal Trade Commission

[Docket C-745]

PART 13—PROHIBITED TRADE PRACTICES

American Foods, Inc., et al.

Subpart—Advertising falsely or misleadingly: § 13.15 *Business status, advantages, or connections:* 13.15-70 Financing activities; 13.15-250 Qualifications and abilities; 13.15-250 Size and extent; § 13.70 *Fictitious guarantee;* § 13.155 *Prices:* 13.155-80 Retail as cost, wholesale, discounted, etc.; § 13.250 *Success, use or standing.*

(Sec. 6, 38 Stat. 721; 15 U.S.C. 46. Interpret or apply sec. 5, 38 Stat. 719, as amended; 15 U.S.C. 45) [Cease and desist order, American Foods, Inc. (St. Paul, Minn) et al., Docket C-745, May 13, 1964]

In the Matter of American Foods, Inc., a Corporation (Formerly American Food Plan of Minnesota, Inc.), American Food Plan of Iowa, Inc., a Corporation, American Foods of North Dakota, Inc., a Corporation, and Walter L. Lange, Individually and as an Officer of Said Corporations, Trading and Doing Business as American Foods, Inc., American Foods, American Food Plan, American Food Plan, Inc., and American Foods Service, Inc.

Consent order requiring three associated corporations with headquarters in St. Paul, Minn., and operating in Minnesota, Iowa, and North Dakota, respectively, to cease making false representations in advertising by radio in connection with their sale of freezers and foods by means of a "Freezer Food Plan" including claims of savings to purchasers, wholesale prices for their food, guarantees, assistance of "food consultants" in planning food orders financing and size of operations, among other things, as in the order below set forth.

The order to cease and desist, including further order requiring report of compliance therewith, is as follows:

PART I

It is ordered, That respondents American Foods, Inc., a corporation, American Food Plan of Iowa, Inc., a corporation, American Foods of North Dakota, Inc., a corporation, and their officers, and Walter L. Lange individually and as an officer of said corporations, and respondents' agents, representatives and employees, directly or through any corporate or other device in or in connection with the offering for sale, sale or distribution of freezers, food or freezer food plans, or other merchandise, in commerce as "commerce" is defined in the Federal Trade Commission Act, do forthwith cease and desist from:

1. Representing, directly or by implication that:

(a) A "food counselor" consultant or other formally trained individual will assist purchasers of the aforesaid Freezer Food Plan in planning their food orders;

(b) The freezer or any part thereof or the food are guaranteed in any manner, unless the nature and extent of the guarantee, and the manner in which the guarantor will perform thereunder are clearly and conspicuously disclosed in immediate conjunction with any such representation;

(c) By purchasing their Freezer-Food plan purchasers can purchase their food requirements and a freezer for the same or less money than they have been paying for food alone;

(d) Purchasers of their freezer-food plan can save enough money on the purchase of food to pay for a freezer;

(e) Purchasers can enter the Freezer Food Plan on a trial basis;

(f) Purchasers of a freezer food plan can buy their food from respondents at wholesale prices.

2. Representing that respondents are the oldest food service in the Midwest.

3. Representing that respondents are the largest food service in the Midwest.

4. Representing that purchasers are entitled to participate in the freezer food plan for a "lifetime."

5. Representing that respondents serve any stated number of families unless respondents actually serve the number represented.

6. Representing that respondents have established a reserve fund or posted a bond the benefits of which are available to purchasers as a guarantee to continuous service unless respondents do in fact have such a fund or bond available and unless the said fund or bond is made available to all purchasers of respondents' product as a guarantee to continuous service.

7. Representing, directly or by implication, that purchasers' contracts: (a) Are financed or carried by corporate respondents and (b) Will not be sold or discounted to others unless respondents establish in every instance, where the representation has been made that the installment contract has been carried by corporate respondents and has not been sold or discounted to others.

8. Misrepresenting in any manner the savings realized by the purchase of the freezer food plan.

9. Obtaining purchasers' signatures on sales contracts which contracts do not at that time contain all of the terms or conditions of sale.

PART II

It is further ordered, That respondents American Foods, Inc., a corporation, American Food Plan of Iowa, Inc., a corporation, American Foods of North Dakota, Inc., a corporation, and their officers, and Walter L. Lange individually and as an officer of said corporations, and respondents' agents, representatives and employees, directly or through any corporate or other device in or in connection with the offering for sale, sale or distribution of any food or purchasing plan involving food, do forthwith cease and desist from:

1. Disseminating or causing to be disseminated, any advertisement by means of the United States mails or by any means in commerce, as "commerce" is defined in the Federal Trade Commission Act, which advertisement contains any representation or misrepresentation prohibited in Paragraphs 1 through 8 of Part I of this order.

2. Disseminating or causing the dissemination of any advertisement by any means for the purpose of inducing or which is likely to induce, directly or indirectly, the purchase of any food, or any purchasing plan involving food in commerce, as "commerce" is defined in the Federal Trade Commission Act, which advertisement contains any of the representations or misrepresentations prohibited in Paragraphs 1 through 8 of Part I of this order.

It is further ordered, That the respondents herein shall, within sixty (60) days after service upon them of this order, file with the Commission a report in writing setting forth in detail the manner and form in which they have complied with this order.

Issued: May 13, 1964.

By the Commission.

[SEAL] JOSEPH W. SHEA,
Secretary.

[F.R. Doc. 64-5414; Filed, June 1, 1964; 8:46 a.m.]

[Docket C-744]

PART 13—PROHIBITED TRADE PRACTICES

Diana Stores Corp.

Subpart—Advertising falsely or misleadingly: § 13.15 *Business status, advantages, or connections:* 13.15-235 Producer status of dealer or seller: 13.15-235(m) Manufacturer. Subpart—Using misleading name—Vendor: § 13.-2445 *Producer or laboratory status of seller.*

(Sec. 6, 38 Stat. 721; 15 U.S.C. 46. Interpret or apply sec. 5, 38 Stat. 719, as amended; 15 U.S.C. 45) [Cease and desist order, Diana Stores Corporation, New York, N.Y., Docket C-744, May 13, 1964]

Consent order requiring the New York City corporate operator of numerous department stores in various states under the trade name "Great Eastern Mills" to cease representing falsely that it manufactured the clothing and other merchandise it sold, by use of the word "Mills" in its corporate or trade name or in any other manner.

The order to cease and desist, including further order requiring report of compliance therewith, is as follows:

It is ordered, That respondent Diana Stores Corporation, a corporation, and its officers and respondent's representatives, agents and employees, directly or through any corporate or other device, in connection with the offering for sale, sale or distribution of clothing or any other merchandise in commerce, as "commerce" is defined in the Federal Trade Commission Act, do forthwith cease and desist from using the word "Mills" or any other word of similar import or meaning in or as a part of respondent's corporate or trade name or representing in any manner that respondent is a manufacturer of the clothing and other merchandise sold by it unless and until respondent owns and operates or directly and absolutely controls a manufacturing plant wherein such clothing or other merchandise is made; provided, however, that should respondent so desire for reasons of continuity, it may use the identifying phrase "formerly Great Eastern Mills" or words of similar import in its advertising for a period not to exceed six months from the effective date of this order.

It is further ordered, That the respondent herein shall, within sixty (60) days after service upon it of this order, file with the Commission a report in writing setting forth in detail the manner and form in which it has complied with this order.

Issued: May 13, 1964.

By the Commission.

[SEAL] JOSEPH W. SHEA,
Secretary.

[F.R. Doc. 64-5415; Filed, June 1, 1964; 8:46 a.m.]

[Docket C-743]

PART 13—PROHIBITED TRADE PRACTICES

Steve Millner et al.

Subpart—Misbranding or mislabeling: § 13.1185 *Composition:* 13.1185-80 Textile Fiber Products Identification Act; 13.1185-90 Wool Products Labeling Act. Subpart—Neglecting, unfairly or deceptively, to make material disclosure: § 13.1852 *Formal regulatory and statutory requirements:* 13.1852-80 Wool Products Labeling Act.

(Sec. 6, 38 Stat. 721; 15 U.S.C. 46. Interpret or apply sec. 5, 38 Stat. 719, as amended; secs. 2-5, 54 Stat. 1128-1130, 72 Stat. 1717; 15 U.S.C. 45, 68, 70) [Cease and desist order, Steve Millner et al. trading as Stylecraft Clothing Co., New York, N.Y., Docket C-743, May 7, 1964]

In the Matter of Steve Millner, and Kiwa Karsh, Individually and as Copartners Trading as Stylecraft Clothing Co.

Consent order requiring New York City manufacturers of suits, jackets and pants for men and boys to cease violating the Textile Fibre Products Identification Act by labeling as "80% rayon, 20% acetate" and "70% rayon, and 30% acetate", clothing which contained substantially different amounts of fibers than so represented; and failing to maintain proper records showing the fiber content of their products; to cease violating the Wool Products Labeling Act by labeling as "All Wool except ornamentation", clothing which contained a substantial quantity of non-woolen fibers; and to cease violating both Acts by failing to label certain of their products with required information and in the required form.

The order to cease and desist, including further order requiring report of compliance therewith, is as follows:

It is ordered, That respondents Steve Millner and Kiwa Karsh, individually and as copartners trading as Stylecraft Clothing Co. or under any other trade name, and respondents' representatives, agents and employees, directly or through any corporate, or other device, in connection with the introduction, delivery for introduction, sale, advertising or offering for sale, in commerce, or in the transportation or causing to be transported in commerce, or the importation into the United States of any textile fiber product; or in connection with the sale, offering for sale, advertising, delivery, transportation or causing to be transported, of any textile fiber product which has been advertised or offered for sale in commerce; or in connection with the sale, offering for sale, advertising, delivery, transportation or causing to be transported, after shipment in commerce, of any textile fiber product, whether in its original state or contained in other textile fiber products, as the terms "commerce" and "textile fiber product" are defined in the Textile Fiber Products Identification Act do forthwith cease and desist from:

A. Misbranding textile fiber products by:

1. Falsely or deceptively stamping, tagging, labeling, invoicing, advertising, or otherwise identifying such products as to the name and amount of constituent fibers contained therein.

2. Failing to affix labels to such products showing each element of information required to be disclosed by section 4(b) of the Textile Fiber Products Identification Act.

B. Failing to maintain records of fiber content of textile fiber products manufactured by them, as required by section 6(a) of the Textile Fiber Products Identification Act and Rule 39 of the regulations thereunder.

It is further ordered, That respondents Steve Millner and Kiwa Karsh, individually and as copartners trading as Stylecraft Clothing Co. or under any other trade name, and respondents' representatives, agents and employees, directly or through any corporate, or other device, in connection with the introduction or manufacture for introduction in commerce, or the offering for sale, sale, transportation or distribution in commerce, as "commerce" is defined in the Wool Products Labeling Act of 1939, of men's and boys' woolen clothing or other "wool products" as such products are defined in and subject to said Wool Products Labeling Act of 1939, do forthwith cease and desist from misbrading such products by:

1. Falsely or deceptively stamping, tagging, labeling or otherwise identifying such products as to the character or amount of the constituent fibers included therein.

2. Failing to affix labels to such products showing each element of information required to be disclosed by section 4(a)(2) of the Wool Products Labeling Act of 1939.

It is further ordered, That the respondents herein shall, within sixty (60) days after service upon them of this order, file with the Commission a report in writing setting forth in detail the manner and form in which they have complied with this order.

Issued: May 7, 1964.

By the Commission.

[SEAL] JOSEPH W. SHEA,
Secretary.

[F.R. Doc. 64-5416; Filed, June 1, 1964; 8:46 a.m.]

[Docket 8524 o.]

PART 13—PROHIBITED TRADE PRACTICES

National Macaroni Manufacturers Association et al.

Subpart—Combining or conspiring: § 13.410 *To eliminate competition in conspirators' goods;* § 13.430 *To enhance, maintain or unify prices.*

(Sec. 6, 38 Stat. 721; 15 U.S.C. 46. Interpret or apply sec. 5, 38 Stat. 719, as amended; 15 U.S.C. 45) [Cease and desist order, National Macaroni Manufacturers Association (Palatine, Ill.) et al., Docket 8524, Apr. 30, 1964]

In the Matter of National Macaroni Manufacturers Association, a corporation, its Officers, and Members; Emanuele Ronzoni, Jr., President, Albert Ravarino, First Vice President, Fred Spadafora, Second Vice President, Robert I. Cowen, Third Vice President, Robert M. Green, Secretary, as Officers of National Macaroni Manufacturers Association; Ronzoni Macaroni Company, Ravarino & Freschi, Inc., Superior Macaroni Company, as Members of National Macaroni Manufacturers Association and as Representatives of the Entire Membership of National Macaroni Manufacturers Association

Order requiring a nonprofit trade association and its member manufacturers who produced most of the macaroni, spaghetti, and related products consumed in the United States, to cease acting collectively to establish the kinds or proportions of ingredients—durum, semolina and farina—to be used in producing macaroni products, for the purpose of fixing the price of such ingredients, specifically in this case durum.

The order to cease and desist, including further order requiring report of compliance therewith, is as follows:

It is ordered, That respondent National Macaroni Manufacturers Association, a corporation, respondents Albert Ravarino, Fred Spadafora, Robert I. Cowen, and Robert M. Green, as officers of said Association; respondents Ronzoni Macaroni Company, Ravarino & Freschi, Inc., and Superior Macaroni Company, corporations, in their capacity as members of the respondent National Macaroni Manufacturers Association and as representative of the entire membership of the National Macaroni Manufacturers Association; said respondents' agents, representatives, employees, successors and assigns; and any and all members of respondent National Macaroni Manufacturers Association, in or in connection with the manufacture, sale, or distribution, in commerce as "commerce" is defined in the Federal Trade Commission Act, of macaroni and related products, do forthwith cease and desist from entering into or carrying out any planned common course of action, understanding, or agreement between any two or more of said respondents or between any one or more of said respondents and others not parties hereto, to do or perform any of the following acts or things: Fix or establish the kinds or proportions of ingredients to be used in producing macaroni and related products, or take any other concerted action, for the purpose of fixing or manipulating the price of such ingredients.

It is further ordered, That respondents shall, within sixty (60) days after service upon them of this order, file with the Commission a report, in writing, setting forth in detail the manner and form in which they have complied with the order set forth herein.

Issued: April 30, 1964.

By the Commission.

[SEAL] JOSEPH W. SHEA,
Secretary.

[F.R. Doc. 64-5417; Filed, June 1, 1964; 8:46 a.m.]

Title 21—FOOD AND DRUGS

Chapter I—Food and Drug Administration, Department of Health, Education, and Welfare

SUBCHAPTER C—DRUGS

PART 130—NEW DRUGS

Required Records and Reports

Correction

In F.R. Doc. 64-5311, appearing at page 7019 of the issue for Thursday, May 28, 1964, the words immediately preceding the proviso of § 130.13(g) should read "or any supplement to it" instead of "of any supplement to it".

Title 29—LABOR

Chapter V—Wage and Hour Division, Department of Labor

SUBCHAPTER A—REGULATIONS

PART 603—FABRIC AND LEATHER GLOVE INDUSTRY IN PUERTO RICO

Wage Order

Pursuant to sections 5, 6, and 8 of the Fair Labor Standards Act of 1938 (29 U.S.C. 205, 206, and 208), the Secretary of Labor by Administrative Order No. 580 (29 F.R. 5763) appointed and convened Review Committee 7 and referred to it and duly noticed a hearing on the question of the minimum rate or rates of wages to be paid under paragraph (C) of Proviso (1) of subsection 6(c) of the Act in lieu of those provided under paragraph (B) of Proviso (1) to employees in the fabric and leather glove industry in Puerto Rico as that industry is defined in 29 CFR 603.1.

Subsequent to an investigation and a hearing conducted pursuant to the notice, the committee filed with the Administrator a report containing its findings and recommendations with respect to the matters referred to it.

Accordingly, as authorized and required by sections 6 and 8 of the Fair Labor Standards Act of 1938, Reorganization Plan No. 6 of 1950 (3 CFR 1949-53 Comp., p. 1004), and General Order No. 45-A of the Secretary of Labor (15 F.R. 3290), the recommendations of the committee are hereby published in this order amending 29 CFR 603.2(a)(1)(i), 603.2(a)(2)(i), 603.2(a)(3)(i), 603.2(a)(4)(i), 603.2(a)(5)(i), and 603.2(a)(6)(i), effective June 2, 1964, to read as follows:

§ 603.2 Wage rates.

* * * * *

(a) *Previously covered classifications.* * * *

(1) *Hand-sewing on fabric gloves classification.* (i) The minimum wage for this classification is 30 cents an hour.

* * * * *

(2) *Hand-sewing on leather gloves classification.* (i) The minimum wage for this classification is 50 cents an hour.

* * * * *

(3) *Other operations on hand-sewn gloves classification.* (i) The minimum wage for this classification is 80 cents an hour.

* * * * *

(4) *Machine operations and the cutting, laying-off, pressing, sizing, banding, and packaging of machine-sewn leather gloves classification.* (i) The minimum wage for this classification is 97.5 cents an hour.

* * * * *

(5) *Machine operations and the cutting, laying-off, pressing, sizing, banding, and packaging of machine-sewn gloves classification (except leather).* (i) The minimum wage for this classification is 97.5 cents an hour.

* * * * *

(6) *Other operations on machine-sewn gloves classifications.* (i) The minimum wage for this classification is 97.5 cents an hour.

* * * * *

(Sec. 8, 52 Stat. 1064, as amended; 29 U.S.C. 208)

Signed at Washington, D.C., this 1st day of June 1964.

CLARENCE T. LUNDQUIST,
Administrator.

[F.R. Doc. 64-5496; Filed, June 1, 1964; 12:16 p.m.]

Proposed Rule Making

DEPARTMENT OF AGRICULTURE

Agricultural Marketing Service

[7 CFR Parts 1001, 1006, 1007, 1014, 1015]

[Docket Nos. AO–14 A–35, AO–203 A–17, AO–204 A–17, AO–302 A–9, AO–305 A–9]

MILK IN CERTAIN NEW ENGLAND MARKETING AREAS

Notice of Extension of Time for Filing Exceptions to Recommended Decision on Proposed Amendments to Tentative Marketing Agreements and to Orders

Pursuant to the provisions of the Agricultural Marketing Agreement Act of 1937, as amended (7 U.S.C. 601 et seq.), and the applicable rules of practice and procedure governing the formulation of marketing agreements and marketing orders (7 CFR Part 900), notice is hereby given that the time for filing exceptions to the recommended decision with respect to the proposed amendments to the tentative marketing agreements and to the orders regulating the handling of milk in the Greater Boston, Springfield, and Worcester, Massachusetts, Southeastern New England, and Connecticut marketing areas, which was issued April 20, 1964 (29 F.R. 5583 and 5838), is hereby further extended to and including June 15, 1964.

Signed at Washington, D.C., on May 27, 1964.

CLARENCE H. GIRARD,
Deputy Administrator,
Agricultural Marketing Service.

[F.R. Doc. 64–5422; Filed, June 1, 1964; 8:46 a.m.]

DEPARTMENT OF COMMERCE

Patent Office

[37 CFR Part 1]

RULES OF PRACTICE IN PATENT CASES

Proposed Order of Examination of Applications

Notice is hereby given that the United States Patent Office proposes to amend one of its rules relating to patents. The amendment is proposed pursuant to the authority contained in Title 35, U.S.C., section 6.

All persons who desire to submit written data, views, arguments or suggestions for consideration in connection with the proposed amendment, are invited to forward the same to the Commissioner of Patents, Washington 25, D.C., within 60 days of publication in the FEDERAL REGISTER. An oral hearing will not be scheduled.

The text of the proposed amendment is as follows:

Section 1.101 of Title 37 C.F.R. (Patent Rule 101) is proposed to be amended by deleting paragraph (b) thereof and replacing it with new paragraph (b) reading as follows:

§ 1.101 Order of examination.

* * * * *

(b) Applications which have been acted upon by the examiner, and which have been placed by the applicant in condition for further action by the examiner (amended applications) shall be taken up for action in such order as shall be determined by the Commission.

(Sec. 1, 66 Stat. 793, 35 U.S.C. 6)

Dated: May 19, 1964.

EDWARD J. BRENNER,
Commissioner of Patents.

Approved:

J. HERBERT HOLLOMON,
Assistant Secretary for
Science and Technology.

[F.R. Doc. 64–5418; Filed, June 1, 1964; 8:46 a.m.]

FEDERAL AVIATION AGENCY

[14 CFR Part 61 [New]]

[Reg. Docket No. 5099; Notice 64–33]

FAA INSPECTORS OR OTHER AUTHORIZED FLIGHT EXAMINERS

Proposed Clarification Status

The Federal Aviation Agency is considering amending Part 61 [New] of the Federal Aviation Regulations to clarify the status of an FAA inspector or other authorized flight examiner conducting a flight test aboard an aircraft by indicating when he is and when he is not considered to be pilot in command.

Interested persons are invited to participate in the making of the proposed rule by submitting such written data, views, or arguments as they may desire. Communications should identify the regulatory docket or notice number and be submitted in duplicate to the Federal Aviation Agency, Office of the General Counsel: Attention Rules Docket, 800 Independence Avenue SW., Washington, D.C., 20553. All communications received on or before August 3, 1964, will be considered by the Administrator before taking action upon the proposed rule. The proposals contained in this notice may be changed in the light of comments received. All comments submitted will be available, both before and after the closing date for comments, in the Rules Docket for examination by interested persons.

Section 1.1 [New] defines "pilot in command" as the "pilot responsible for the operation and safety of an aircraft during flight time." This definition indicates those individuals upon whom the duties and obligations of a pilot in command, as required by the regulations, are imposed. For example, under the provisions of Part 61 [New] the pilot in command is responsible for certain preflight action, is delegated emergency authority to deviate from prescribed rules, and is required under prescribed circumstances to submit appropriate notices or reports.

Although the application of the definition has been difficult in some cases because of the unusual circumstances involved, it has provided a standard by which the pilot in command can be determined under the various circumstances of aircraft configuration and flight crews. However, at times the definition has been improperly applied to FAA inspectors or other authorized flight examiners performing official flight test duties aboard aircraft. In order to permit application of the definition properly and effectively, the status of an FAA inspector or other authorized flight examiner must be made unmistakably clear to all concerned.

The presence of an FAA inspector or other authorized flight examiner in the cockpit or on the flight deck of an aircraft during flight does not, in itself, make him the pilot in command of the aircraft. The circumstances of each flight determine whether the inspector or other examiner at any given time is acting as pilot in command. In the case of a flight test, the FAA inspector or other authorized flight examiner is aboard the aircraft to observe the applicant's ability to perform specified procedures and maneuvers. He usually does not assume control of the aircraft by taking command of the controls or by exercising authority over the applicant by direct command. Notwithstanding this status of the inspector or other examiner, at times persons consider him to be the pilot in command of the aircraft for the entire flight when he is conducting a flight test of a student pilot. It appears that this conclusion is not reached by a consideration of the duties actually performed aboard the aircraft by the inspector or other examiner, but for other reasons, such as to avoid the passenger carrying prohibition for student pilots. A similar situation arises when an FAA inspector conducting a flight test in a cargo only aircraft or an experimental aircraft is considered pilot in command simply because passengers are not permitted aboard. These applications of the pilot in command rules are unrealistic.

To arrive at a conclusion that the FAA inspector or other authorized flight examiner is pilot in command without regard to whether he is in a position to manipulate the flight controls or to assume responsibility for the manipulation of the flight controls, serves no useful safety purpose. Instead, it results in a circumvention of the duties and responsibilities that should be imposed by the regulations upon the individual actually serving as pilot in command. Therefore, in order to clarify the status of the FAA inspector or other authorized flight examiner while conducting a flight test aboard an aircraft, it is proposed to add a new section to Part 61 [New] that expressly states that his purpose aboard the aircraft under these circumstances is to observe the applicant's skill and ability in the operation of the aircraft. It will expressly remove him from the passenger limitations of the regulations and exclude him from the application of the definition of pilot in command while so observing the applicant, except when he actually serves as pilot in command.

It is impossible to anticipate and describe every conceivable act and circumstance that would establish the requisite degree of control to call the FAA inspector or other authorized flight examiner the pilot in command of the aircraft. However, the proposed amendment would clarify that he is not the pilot in command when he has no control over the operation of the aircraft and merely acts as an observer. Conversely it would provide that he is considered pilot in command when he actually assumes control of the operation of the aircraft by either taking command of the controls, or by exercising authority over the applicant by direct command.

In consideration of the foregoing, the Agency proposes to amend Part 61 [New] of Chapter I of Title 14 of the Code of Federal Regulations by adding a new § 61.26 to read as follows:

§ 61.26 Flight tests; status of FAA inspectors and other authorized flight examiners.

An FAA inspector or other authorized flight examiner conducts the flight test of an applicant for a pilot certificate or rating for the purpose of observing the applicant's ability to perform satisfactorily the procedures and maneuvers on the flight test. The inspector or other examiner is not pilot in command of the aircraft unless he assumes control of its operation by taking command of the controls or by exercising authority over the applicant by direct command. Notwithstanding the type of aircraft used during a flight test, the applicant and the inspector or other examiner are not, with respect to each other, subject to the requirements or limitations for the carriage of passengers specified in this chapter.

This amendment is proposed under the authority of sections 313(a), 601, and 602 of the Federal Aviation Act of 1958 (49 U.S.C. 1354, 1421, 1422).

Issued in Washington, D.C., on May 26, 1964.

W. Lloyd Lane,
Acting Director,
Flight Standards Service.

[F.R. Doc. 64–5413; Filed, June 1, 1964; 8:46 a.m.]

FEDERAL COMMUNICATIONS COMMISSION

[47 CFR Parts 21, 91]

[Docket Nos. 14895, 15233; FCC 64–447]

MICROWAVE STATIONS USED TO RELAY TELEVISION BROADCAST SIGNALS

Order Extending Time for Filing of Reply Comments

In the matters of amendment of Subpart L, Part 11 (now Part 91), to adopt rules and regulations to govern the grant of authorizations in the Business Radio Service for microwave stations to relay television signals to community antenna systems, Docket No. 14895; amendment of Subpart I, Part 21, to adopt rules and regulations to govern the grant of authorizations in the Domestic Public Point-to-Point Microwave Radio Service for microwave stations used to relay television broadcast signals to community antenna television systems, Docket No. 15233.

At a session of the Federal Communications Commission held at its offices in Washington, D.C., on the 20th day of May 1964:

The Commission having before it a request by the National Association of Broadcasters (NAB) that the time for filing reply comments in the above-captioned proceeding be extended from June 11 to June 18, 1964; and

It appearing that an extension of one week will not unduly delay Commission action in this proceeding, and that the public interest, convenience, and necessity will be served by extending the date for filing reply comments as requested;

It is ordered, That the time for filing reply comments in the above-captioned proceedings is extended to June 18, 1964.

Released: May 26, 1964.

Federal Communications Commission,
[seal] Ben F. Waple,
Secretary.

[F.R. Doc. 64–5431; Filed June 1, 1964; 8:47 a.m.]

SMALL BUSINESS ADMINISTRATION

[13 CFR Part 107]

SMALL BUSINESS INVESTMENT COMPANIES

Notice of Proposed Rule Making

Notice is hereby given that pursuant to authority contained in section 308 of the Small Business Investment Act of 1958, Pub. Law 85–699, 72 Stat. 694, as amended, it is proposed to amend, as set forth below, Part 107 of Subchapter B, Chapter I of Title 13 of the Code of Federal Regulations, as revised in 27 F.R. 9743–9754, and amended in 28 F.R. 681, 1627, 3021, 10868, 12250 and 29 F.R. 5223, by adding thereto new §§ 107.502 and 107.719 and amending present §§ 107.205, 107.302, 107.704, and 107.713. Prior to the final adoption of such amendments, consideration will be given to any comments or suggestions pertaining thereto which are submitted in writing, in triplicate, to the Investment Division, Small Business Administration, Washington 25, D.C., within a period of thirty days of the date of this notice in the Federal Register.

Information. Section 107.704(c)(5) of the regulations now provides that a Licensee, without SBA's prior written consent, shall not have an officer or a director who at the same time is either an officer or a director of another Licensee and, further, that 10 or more percent of the stock of a Licensee shall not be owned or controlled, directly or indirectly, by any person which owns or controls, directly or indirectly, 10 or more percent of the stock of any other Licensee. The amendment to § 107.704(c)(5) now under consideration would extend the prohibition against the same party owning or controlling, directly or indirectly, 10 or more percent of the stock of two or more Licensees to include also acquisition rights to such stocks; and would add a proviso authorizing two or more Licensees, with SBA approval, to employ a common general manager who may at the same time serve as an officer of one or more of such Licensees, if (1) their paid-in capital and paid-in surplus from private sources (excluding organizational expenses) does not in the aggregate exceed $750,000 and (2) 50 or more percent of the dollar amount of equity securities acquired and loans made by each such Licensee does not at any time relate to the same concerns in which the other such Licensees have an investment. This latter provision is intended, among other things, to prevent commonly-managed SBIC's from placing a majority of their investments in larger firms by means of participation financing. Permission to operate with common managers would be available to smaller SBIC's in order to provide them an opportunity to increase their operating efficiency but it is not intended as an encouragement to overlook the financing requirements of smaller members of the small business community. The proposed amendment declares that, for the purposes of the regulations, a common general manager shall be deemed an officer of each Licensee company and that his appointment as well as compensation shall be subject to prior SBA approval. Several safeguards are provided to insure fair conduct on his part. The common general manager may not own or control a greater percentage amount of stock (including acquisition rights thereto) in one such Licensee than in any other such Licensee of the group. He may not conclude on behalf of any such Licensee financing arrangements or advisory service contracts with small business concerns without first having provided all such Licensees an equal opportunity to participate. Transactions negotiated by him with small business concerns must, prior to consummation, be approved by the boards of directors of the respective Licensees participating therein.

In order to effectuate the proposed system of enabling smaller SBIC's to employ a common general manager, an amendment to § 107.713 is also under consideration which would permit necessary modifications to be made in existing common tenancy restrictions against the sharing of office space by two or more Licensees. Section 107.713 now provides that a Licensee may not maintain its office or place of doing business in the same physical premises or place of business or another Licensee. It also prohibits two or more Licensees from sharing a common private entrance or connecting door. The amendment under consideration would provide that Licensees employing a common general manager pursuant to § 107.704(c)(5) could apply to SBA for an exemption from the provisions of § 107.713.

Section 107.302(a)(7) of the regulations recognizes that a Licensee may merge with another Licensee. It provides that a Licensee may issue any of its securities in connection with a statutory or other type of merger or consolidation "with another Licensee." The amendment under consideration would expand the coverage of § 107.302(a)(7) to include mergers or consolidations of Licensees with non-Licensee companies "approved by SBA pursuant to § 107.704(g)." The amendments under consideration would add a new § 107.704(g) to the regulations spelling out the criteria governing a Licensee's application for SBA approval to merge with another Licensee or non-Licensee company. The new section would provide that the proposed merger must be approved by a two-thirds majority vote of the stockholders of each company and that the resultant company must qualify as a Licensee. Favorable consideration by SBA will depend on the attendant circumstances indicating that the proposed merger will augment funds available to or will otherwise benefit the SBIC program. Approval will be subject to such terms and conditions as SBA may impose to assure that the plan is fair, equitable and feasible; adequate provision is made for dissenting stockholders; and the management and investment plans of the resultant Licensee company conform with the Act and regulations, and its portfolio securities so conform or can be conformed within a reasonable period.

On November 16, 1963, notice of proposed rule making was published in the FEDERAL REGISTER (28 F.R. 12228) concerning amendment of § 107.704(c)(1) and § 107.704(c)(3) to permit Licensee companies voluntarily to reduce their paid-in capital and paid-in surplus, by one-third, within the two-year periods specified therein, the reduction to be accomplished only by a pro rata distribution of such capital. After due consideration of the comments received, SBA has determined to republish the amendment under consideration in expanded form to provide that, in lieu of pro rata distribution, a Licensee may apply to SBA for approval to permit the capital reduction to be carried out in special instances under other plans of distribution and, in a proposed new subdivision (iii) of § 107.704(c)(1), that Licensees having accumulated unappropriated retained earnings may purchase their own capital stock for cancellation and retirement to the extent and under the terms and conditions specified therein. Proposed § 107.704(c)(1) published herewith also includes new subdivisions (iv) and (v) setting forth reasonable safeguards and restrictions upon a Licensee's right to reduce paid-in capital and paid-in surplus or to purchase its own stock for cancellation and retirement. As a companion measure, it is proposed that § 107.205 dealing with surrender of SBIC licenses and plans of dissolution also be amended. The amendment under consideration would redesignate the present text of § 107.205 as paragraph (a), and add a new paragraph (b) directed against so-called "raiding" practices leading to forced liquidation of a Licensee.

Under proposed new subdivision (iii) of § 107.704(c)(1), as set forth below, a Licensee having accumulated unappropriated retained earnings could file an application for SBA approval to purchase its own capital stock. Favorable consideration by SBA would depend on the applicant satisfying the following conditions: (1) The Licensee's shares are to be purchased on the open market or pursuant to tenders offered to all shareholders; (2) the purchase will be in an amount not exceeding accumulated unappropriated retained earnings which, immediately prior to or simultaneously therewith, have been capitalized through the issuance of a stock dividend to all shareholders; (3) the per share value of the stock dividend is not less than the average paid-in capital per share at the time such dividend is declared (par or stated value of capital stock issued, plus paid-in surplus, divided by the number of shares of capital stock issued); and (4) the stock acquired is thereupon cancelled and retired.

In section 102 of the Small Business Investment Act of 1958, Congress has declared it to be the policy of the legislation "to improve and stimulate the national economy in general * * * and supplement the flow of private equity capital and long-term loan funds which small business concerns need for the sound financing of their business operations and for their growth, expansion, and modernization, and which are not available in adequate supply." Experience to date indicates that several years may be required to enable a Licensee to invest fully its funds in promising small businesses and to show reasonable appreciation of its paid-in capital and paid-in surplus. SBA is particularly concerned with the so-called practice of "raiding" with a view to forcing liquidation of a Licensee prior to the time when the Licensee can be expected to be fully established and operating according to the purposes of the Act. The practice of raiding for this purpose usually involves the acquisition of substantial blocks of the stock of a Licensee, or rights to control such blocks, at prices or as a result of considerations which would cause the parties to such acquisition to reap substantial profits through the liquidation of the Licensee.

Accordingly, proposed subdivision (iv) to § 107.704(c)(1), as set forth below, would prohibit a Licensee from reducing its paid-in capital and paid-in surplus if (1) there has been a major change in its Board of Directors or in parties owning or otherwise controlling 10 or more percent of its stock within one year prior to the proposed reduction; or (2) its stock is selling in the open market at a price per share equivalent to or less than that portion of book value per share which is represented by cash (plus funds invested or placed on deposit pursuant to § 107.710 of the regulations); or (3) the proposed reduction will reduce cash (plus funds invested or placed on deposit pursuant to § 107.710) to an amount less than 20 percent of the Licensee's outstanding equity investments, long-term loans, and commitments under §§ 107.501 and 107.601 of the regulations. These restrictions would not be applicable to Licensees having paid-in capital and paid-in surplus from private sources not exceeding $700,000.

As set forth below, proposed subdivision (v) to § 107.704(c)(1) would render a Licensee ineligible for additional section 302 or section 303 funds for a period of one year after accomplishing a reduction of capital. This restriction would not apply if such reduction has been no greater than the Licensee's unappropriated retained earnings immediately prior to the capital reduction. SBA may also grant an exemption from the one-year restriction where the circumstances are such that an exemption will further the purposes of the Act.

As set forth below, proposed paragraph (b) to § 107.205 would withhold SBA's approval of a Licensee's plan of dissolution leading toward surrender of its license unless it could demonstrate that (1) there has been no major change in the Board of Directors or in parties owning or otherwise controlling 10 or more percent of its stock during the immediately preceding year; (2) substantial efforts have been made to operate the Licensee successfully but due to conditions peculiar to the Licensee, it has not been able to accomplish the purposes of the Act; and (3) the plan of dissolution does not call for distribution of cash to stockholders during a period of one year from the date of Licensee's application, unless prior SBA approval therefor has been obtained; or (4) it would be in the best interests of the SBIC program to allow the Licensee to dissolve and surrender its license. The restrictions mentioned in (1), above, would not be applicable to Licensees having paid-in capital and paid-in surplus from private sources of less than $700,000. In addition, the restrictions set forth in (2) to (4), above, would not apply to small Licensees having paid-in capital and paid-in surplus from private sources of less than $300,000.

As set forth below, subject amendments under consideration would add a new § 107.502 for the purpose of restating and defining the conditions under which a Licensee may exercise temporary control over a small business concern. The rules set forth in the new section reflect SBA operating policies which have been developed and applied since the inception of the SBIC program. This proposed amendment points out that the Act contemplates that a Licensee company shall finance small business concerns through equity investments and long-term loans but does not contemplate that Licensees shall operate business enterprises or function as holding companies exercising control over such enterprises. The new section sets forth rules as to when a Licensee will be deemed to control a small business concern whose voting securities are privately-held, or are traded on the over-the-counter market or are listed on a stock exchange. It provides guidelines with respect to control of a small business concern exercised by two or more Licensees. It also describes situations where a Licensee may acquire temporary control for the purpose of protecting its investment or, pursuant to SBA's prior approval, where exceptional circumstances warrant special treatment consonant with the purposes of the Act. The new section requires a Licensee which has assumed control over a small business concern to enter into a plan of divestiture providing for ultimate relinquishment of such control within a reasonable period.

As set forth below, subject amendments under consideration would add a new § 107.719 which defines the conditions under which the Licensee may retain its long-term loans, equity investments, and advisory service contracts acquired with respect to a small business concern which has subsequently become large as a result of normal growth or as a result of sale or merger. The provisions of the new section clarify and conform substantially to SBA operating policies established during the SBIC program relative to this subject.

It is proposed to amend the Regulations Governing Small Business Investment Companies as follows:

1. By redesignating the provisions of § 107.205 as paragraph (a) thereof and adding a new paragraph (b). As amended, § 107.205 will read as follows:

§ 107.205 Surrender of License and dissolution.

(a) A Licensee shall not surrender its license without prior written approval of SBA. Any request by a Licensee for approval of the surrender of a license shall be accompanied by a plan of dissolution. Such plan shall include provisions for the liquidation of assets, distribution thereof to shareholders, the surrender of the corporate charter, and the termination of the Licensee's existence as a corporate body. The plan shall provide for its consummation within a reasonable period of time and shall be subject to the approval of SBA. The surrender of the license shall become effective upon a determination by SBA that the provisions of the plan have been consummated.

(b) SBA will not approve a plan of dissolution leading to surrender of a license unless it can be demonstrated to the satisfaction of SBA:

(1) That there has been no major change in the Board of Directors of the Licensee or in parties owning, holding or controlling, directly or indirectly, 10 or more percent of its stock within one year previous to the date of application for approval of the surrender and plan of dissolution: *Provided, however,* That the foregoing shall not apply to Licensees having paid-in capital and paid-in surplus from private sources of less than $700,000 (excluding organizational expenses);

(2) That substantial efforts have been made to operate the Licensee successfully but due to conditions peculiar to the Licensee, it has been unable to accomplish the purposes of the Act; and

(3) That the plan of dissolution does not call for distribution of cash to stockholders of the Licensee prior to the expiration of one year from the date of application, unless prior SBA approval therefor has been obtained pursuant to a finding made under subparagraph (4) of this paragraph; or

(4) That it would be in the best interest of the SBIC program to allow the Licensee to dissolve and surrender its license.

The restrictions set forth in subparagraphs (2) to (4) of this paragraph, do not apply to Licensees having paid-in capital and paid-in surplus from private sources of less than $300,000 (excluding organizational expenses).

2. By adding to subparagraph (7) of § 107.302(a) the words "or non-Licensee company" immediately after the words "another Licensee" and inserting the phrase "pursuant to § 107.704(g)" immediately after "SBA". As amended, § 107.302(a) will read as follows:

§ 107.302 Consideration for stock of Licensee.

(a) A Licensee may issue any of its securities for (1) cash, (2) direct obligations of, or obligations guaranteed as to principal and interest by, the United States, (3) securities of which it is the issuer, in connection with a reclassification approved by SBA, (4) services previously rendered to the Licensee, (5) physical assets to be currently employed in the operation of the Licensee, (6) as a dividend, and (7) in connection with a statutory or other type of merger or consolidation with another Licensee or non-Licensee company approved by SBA pursuant to § 107.704(g): *Provided, however,* That any shares of stock issued as part of the initial minimum capital required by § 107.202(c) may be issued only in consideration of the simultaneous payment of cash or upon the simultaneous transfer to the Licensee of securities permitted by § 107.202(c). A Licensee may issue its stock for Equity Securities of a small business concern pursuant to the provisions of section 304(c) of the Act.

3. By adding a new § 107.502 which will read as follows:

§ 107.502 Control of small business concerns by Licensee.

(a) *General.* The Act contemplates that a Licensee shall finance small business concerns through equity investments and long-term loans. It does not contemplate that Licensees shall operate business enterprises or function as holding companies exercising control over such enterprises. Accordingly, a Licensee may not acquire equity securities of a small business concern primarily for the purpose of exercising indefinite control over it nor may such control be exercised by one or more Licensees through management agreements, voting trusts, majority representation on the board of directors, or otherwise.

(b) *Presumption of control.* A Licensee will be deemed to control a small business concern when it owns, holds, or controls, directly or indirectly, voting securities (or acquisition rights thereto through conversion privileges, options, warrants, or otherwise) equivalent to 50 or more percent of the outstanding voting securities, if the voting securities of the small business are privately held. If the voting securities of the small business are traded on the over-the-counter market or are listed on a stock exchange, there will be a presumption of control if a Licensee owns, holds, or controls, directly or indirectly, 25 or more percent of the outstanding voting securities (or acquisition rights thereto) of such small business. This presumption may be rebutted by the submission of appropriate evidence satisfactory to SBA.

(c) *Control by two or more Licensees.* Where a small business concern has been financed by two or more Licensees, the aggregate amount of its voting securities (and acquisition rights thereto) which have been acquired and are held or controlled, directly or indirectly, by such Licensees acting in concert or as coparticipants shall constitute the basis for determining whether control exists pursuant to paragraph (b) of this section.

(d) *Temporary control permitted.* A Licensee may acquire temporary control over a small business concern from which it has acquired equity securities or to which it has made long-term loans only where (1) the financing is necessary to rehabilitate such concern which is threatened with insolvency or closure due to financial difficulty; or (2) the financing is provided to a small business concern which has been in existence for less than one year and the funds furnished by the Licensee constitute the major source of capital of the small business concern; or (3) assumption of control is reasonably necessary for the protection of Licensee's investment; or (4) SBA's prior approval has been obtained in exceptional circumstances warranting special treatment consonant with the purposes of the Act.

(e) *Plan of divestiture.* Where control of a small business concern is assumed by a Licensee in accordance with paragraph (d) of this section, the Licensee must negotiate and enter into a plan of divestiture providing for ultimate relinquishment of such control. The plan may (1) provide that other existing stockholders of the small business concern shall have the right, through warrants, options or otherwise, to reacquire control from the Licensee or the right of first refusal to purchase controlling securities from it on terms and conditions negotiated at the time of the original financing; or (2) incorporate such other appropriate contractual arrangements assuring divestiture of control as may be negotiated, at or prior to assumption of actual control, upon a mutually satisfactory basis between the Licensee and other parties in interest.

(f) *Time of divestiture.* The plan of divestiture must provide for relinquishment of Licensee's control within a reasonable period of time. A plan will be considered reasonable if it provides for divestiture of control within three years from the date control is assumed by the Licensee or its representatives or is coincident with the small business concern having operated at a profit sufficient to recover losses, if any, incurred by the small business concern subsequent to the Licensee's initial investment or commitment to invest in the small business concern; or the terms governing consummation of the divestiture have been approved by SBA.

§ 107.704 [Amended]

4a. By deleting paragraph (c)(1) of § 107.704 *Activities of Licensee*, in its entirety and substituting a new paragraph (c)(1). As amended, § 107.704(c)(1) will read as follows:

(1)(i) A Licensee voluntarily may reduce its paid-in capital and paid-in surplus by an amount not exceeding one-third thereof at any time prior to August 1, 1966, and thereafter voluntarily may reduce its paid-in capital and paid-in surplus by an amount not exceeding one-third thereof at any time during each two-year period immediately subsequent thereto. The largest amount of Licensee's paid-in capital and paid-in surplus ever outstanding shall be used in computing and applying the one-third limitation hereunder.

(ii) Any voluntary reduction in paid-in capital and paid-in surplus consummated prior to the effective date hereof shall be subtracted from the one-third amount permitted during the first two years prior to August 1, 1966. The one-third limitation specified hereunder may be exceeded in order to redeem any outstanding preferred stock, or to qualify as a regulated investment company pursuant to section 851 of the Internal Revenue Code of 1954, as amended, or to consummate a quasi-reorganization approved by SBA, or to comply with any contractual arrangements between the Licensee and its stockholders approved by SBA prior to the effective date hereof. Any voluntary reduction in paid-in capital and paid-in surplus permissible within the limitations set forth herein may be accomplished only by a pro rata distribution of such capital, unless prior SBA approval is obtained permitting such reduction to be carried out in special instances under other plans of distribution. Licensees voluntarily shall not reduce their paid-in capital and paid-in surplus below $300,000, except as may be allowed pursuant to plan of dissolution approved by SBA under § 107.205.

(iii) A Licensee having accumulated unappropriated retained earnings may file an application for SBA approval under subdivision (ii) of this subparagraph to purchase its own capital stock. SBA will give favorable consideration to such an application where (*a*) the Licensee's shares are to be purchased on the open market or pursuant to tenders offered to all shareholders; (*b*) the proposed purchase will be in an amount not exceeding accumulated unappropriated retained earnings which, immediately prior to or simultaneously with such purchase, have been capitalized through the issuance of a stock dividend to all shareholders; (*c*) the per share value of the stock dividend issued to capitalize accumulated unappropriated retained earnings shall be not less than the average paid-in capital per share existing at the time the dividend is declared (par or stated value of capital stock issued plus paid-in surplus divided by the member of shares of capital stock issued); and (*d*) the stock acquired is thereupon cancelled and retired.

(iv) A Licensee may not reduce its paid-in capital and paid-in surplus pursuant to this section if (*a*) there has been a major change in its Board of Directors or in parties owning, holding or controlling, directly or indirectly, 10 or more percent of its stock within one year prior to the proposed reduction or (*b*) shares of stock issued by the Licensee are selling in the open market at a price per share which is equivalent to or less than that portion of book value per share which is represented by cash plus funds invested pursuant to § 107.710 or (*c*) the proposed reduction will reduce cash plus funds invested pursuant to § 107.710 to an amount which is less than 20 percent of the Licensee's equity investments and long-term loans, including commitments with respect thereto, pursuant to §§ 107.501 and 107.601. The foregoing provisions of this subdivision (iv) shall not be applicable to a Licensee having paid-in capital and paid-in surplus from private sources not exceeding $700,000.

(v) For a period of one year after accomplishing a reduction pursuant to this section, a Licensee will not be eligible for additional funds under §§ 107.301 and 107.402: *Provided, however,* That this restriction shall not apply if the reduction in paid-in capital and paid-in surplus has been no greater than the unappropriated retained earnings of the Licensee immediately prior to such reduction: *And provided, further,* That SBA may grant an exemption from this restriction if in its discretion such exemption will further the purposes of the Act.

b. By deleting paragraph (c)(3) of § 107.704 *Activities of Licensee,* in its entirety and substituting a new paragraph (c)(3). As amended, § 107.704 (c)(3) will read as follows:

(3) A Licensee shall not increase its paid-in capital and paid-in surplus consummated pursuant to subparagraph (1) of this paragraph. Such report shall be in the form of a post-licensing amendment and shall set forth the date and amount of the reduction effected as well as the form and manner of distribution made to stockholders.

c. By deleting paragraph (c)(5) of § 107.704 *Activities of Licensee,* in its entirety and substituting a new paragraph (c)(5). As amended, § 107.704(c)(5) will read as follows:

(5) Without the prior written consent of SBA, a Licensee shall not have an officer or a director who at the same time is either an officer or director of any other Licensee, nor shall 10 or more percent of the stock or acquisition rights thereto of any Licensee be owned or controlled, directly or indirectly, by an officer or director of, or by any party owning or controlling, directly or indirectly, 10 or more percent of the stock or acquisition rights thereto of another Licensee: *Provided, however,* That an attorney performing legal services for Licensees may serve as secretary or clerk for more than one such Licensee: *And provided, further,* That an individual may serve as the general manager of more than one Licensee if (i) the paid-in capital and paid-in surplus from private sources (excluding organizational expenses) of such Licensees does not exceed in the aggregate the sum of $750,000 at the time of each employment and (ii) notwithstanding the provisions of § 107.708(b) permitting participation among Licensees, at no time shall 50 or more percent of the dollar amount of equity securities acquired and loans made by any such Licensee relate to small business concerns in which any other such Licensee has an investment. The percentage amount of stock or acquisition rights thereto which the general manager may own or control, directly or indirectly, in one such Licensee may not at any time be greater than the percentage amount which he owns or controls, directly or indirectly, in any other such Licensee. He shall not undertake to conclude on behalf of any such Licensee agreements with small business concerns providing for long-term loans, acquisition of equity securities or consulting and advisory services without first having offered all such Licensees an equal opportunity to participate therein. Each such transaction negotiated by the general manager on behalf of such Licensees shall, prior to consummation thereof, be approved by the boards of directors of the respective Licensees participating therein. For the purposes of these Regulations, a common general manager shall be deemed an officer of each Licensee, and his appointment as well as compensation shall be subject to prior SBA approval.

d. By adding a new paragraph (g) to § 107.704 *Activities of Licensee,* which will read as follows:

(g) Subject to the prior approval of SBA, a Licensee may participate as a party to a statutory or other type of merger or consolidation with another Licensee or non-Licensee company where the resultant company will qualify as a Licensee. The proposed merger or consolidation must be approved by a two-thirds majority vote of the stockholders of each company. SBA will give consideration to such a transaction if the attendant circumstances indicate that it will augment funds available to or will otherwise benefit the SBIC program. Applications for approval of the plan of merger or consolidation will be subject to such terms and conditions as SBA, in its discretion, may impose to assure, among other things, that (1) the plan is fair, equitable and feasible; (2) adequate provision is made with regard to the rights of dissenting stockholders; and (3) the management and investment plans of the resultant Licensee company are in conformity with applicable provisions of the Act and regulations and its portfolio securities are in conformity therewith or can be conformed within a reasonable period of time.

5. By deleting § 107.713 in its entirety and substituting a new § 107.713. As amended, § 107.713 will read as follows:

§ 107.713 Common tenancy.

(a) A Licensee shall not establish or maintain an office or place of doing business which is located in the same physical premises or place of business of any other Licensee. A Licensee shall not have a common private entrance or a private connecting door or entrance with any other Licensee. Nothing contained herein shall prevent two or more Licensees from occupying the same office building.

(b) Licensees employing a common general manager pursuant to § 107.704 (c)(5) may apply to SBA for an exemption from the provisions of this section.

6. By adding a new § 107.719 which will read as follows:

§ 107.719 Retention of loans, investments, and advisory service contracts.

(a) *General.* The Act requires each Licensee to assist small business concerns so as to encourage their growth, expansion, and modernization. In fulfilling this requirement many small business concerns which have been assisted will grow large and will no longer qualify as small pursuant to §§ 107.12 and 121.3–11. In other instances, the securities of small business concerns will be exchanged for those of large businesses pursuant to the merger of small business concerns into large businesses or pursuant to sale of the holdings of a Licensee to large businesses.

(b) *Normal growth.* A Licensee may indefinitely retain the securities of a business which qualified as a small business concern at the time the Licensee acquired such securities, and which concern subsequently became large as a result of normal growth. Such concern will be considered to have experienced normal growth if it increased in size due to retained earnings, public sale of its securities, merger with other small business concerns, or as a result of other circumstances approved by SBA.

(c) *Sale or merger of small businesses.* When a Licensee receives the securities of a large business pursuant to the merger of a portfolio small business concern with a large business or as consideration for the sale of its portfolio securities to a large business, SBA may require the Licensee to divest itself of such securities. A reasonable period of time will be permitted for divestiture in order to minimize any adverse effects on the Licensee. Generally divestiture will not be required until the Licensee can be expected to recover fully the amount of its investment in the original portfolio small business concern plus a reasonable return on its investment.

(d) *Additional investments.* When a small business has become large through normal growth, merger, or sale, a Licensee may make additional investments in the resultant large business concern only to the extent of honoring its commitment liability entered into while the business still qualified as a small business concern. Nothing contained herein shall preclude a Licensee from making an additional investment if necessary to protect its original investment.

(e) *Consulting and advisory services.* In case a small business concern becomes large pursuant to paragraph (b) or (c) of this section, a Licensee holding a contract for advisory and consulting services in accordance with § 107.705 may perform such services for the duration of that contract.

Dated: May 26, 1964.

EUGENE P. FOLEY,
Administrator.

[F.R. Doc. 64-5424; Filed, May 27, 1964; 3:48 p.m.]

Notices

DEPARTMENT OF THE TREASURY

Office of the Secretary

[Dept. Circ. 570; 1964 Revision]

COMPANIES HOLDING CERTIFICATES OF AUTHORITY AS ACCEPTABLE SURETIES ON FEDERAL BONDS AND AS ACCEPTABLE REINSURING COMPANIES

JUNE 1, 1964.

This circular is published annually as of June 1, solely for the information of Federal bond-approving officers and persons required to give bonds to the United States. Interim changes in this circular are published in the FEDERAL REGISTER as they occur.

The following companies, except where otherwise noted, have complied with the law and the regulations of the Treasury Department and are acceptable as sureties on Federal bonds, to the extent and with respect to the localities indicated opposite their respective names.

[SEAL]

JOHN K. CARLOCK,
Fiscal Assistant Secretary of the Treasury.

COMPANIES HOLDING CERTIFICATES OF AUTHORITY FROM SECRETARY OF THE TREASURY UNDER ACT OF CONGRESS, APPROVED JULY 30, 1947 (6 U.S.C. 6-13) AS ACCEPTABLE SURETIES ON FEDERAL BONDS (a)

Names of companies and locations of principal executive offices	Underwriting limitations (net limit on any one risk) see footnote (b)	States and other areas in which licensed to transact a fidelity and surety business. See footnote (c)	State in which incorporated and judicial districts in which process agents have been appointed. (State of incorporation in capitals. Letters preceding names of States indicate judicial districts.) See footnote (d)
The Aetna Casualty and Surety Company, Hartford, Conn.	$31,581,000	All except Canal Zone, Virgin Islands	CONN.—All except Virgin Islands.
Aetna Insurance Company, Hartford, Conn.	11,927,000	All except Canal Zone	CONN.—All except Canal Zone, Hawaii, Virgin Islands.
Agricultural Insurance Company, Watertown, N.Y.	1,509,000	All except Canal Zone, Puerto Rico, Virgin Islands	N.Y.—All except Alaska, Canal Zone, Conn., Del., Hawaii, seIll., Ind., Ky., Me., Md., Mich., Miss., N.H., N.C., Okla., Puerto Rico, R.I., Tenn., Vt., Va., Virgin Islands, W. Va.
Allegheny Mutual Casualty Company Meadville, Pa.	95,000	Alaska, D.C., Fla., Ind., Md., Mich., N.J., Ohio, Pa., Wis.	PA.—D.C., sFla., nIll., Md., eMich., N.J., Ohio, eWis.
American Automobile Insurance Company, Newark, N.J.	5,905,000	All except Canal Zone, Puerto Rico, Virgin Islands	MO.—All except Canal Zone, Puerto Rico, Virgin Islands.
American Casualty Company of Reading, Pennsylvania, Reading, Pa.	3,042,000	All except Canal Zone, Virgin Islands	PA.—All except Virgin Islands.
American Central Insurance Company, New York, N.Y.	946,000	All except Canal Zone, Del., Idaho, La., Oreg., Puerto Rico, S.C., Virgin Islands.	MO.—All except Canal Zone, Puerto Rico, Virgin Islands.
American Credit Indemnity Company of New York, Baltimore, Md.	2,075,000	Cal., Colo., Conn., Del., Ill., Ind., Iowa, Ky., Me., Md., Mass., Minn., Mo., N.H., N.J., N. Mex., N.Y., N.C., Ohio, Okla., Pa., R.I., Vt., Wash., W. Va., Wis.	N.Y.—D.C.
American Employers' Insurance Company, Boston, Mass.	3,532,000	All except Canal Zone	MASS.—All.
American Fidelity Company, Manchester, N.H.	350,000	Conn., Me., Mass., Miss., N.H., R.I., Vt	VT.—All except Canal Zone, Kans., Puerto Rico, Virgin Islands.
American Fire and Casualty Company, Orlando, Fla.[1]	748,000	Ala., Ark., Colo., D.C., Fla., Ga., Kans., Ky., La., Md., Miss., Mo., N.C., Okla., Puerto Rico, S.C., Tenn., Tex., Va.	FLA.—Ala., Ark., Colo., D.C., Ga., Kans., Ky., La., Md., Miss., Mo., N.C., Okla., S.C., Tenn., Tex., Va.
American and Foreign Insurance Company, New York, N.Y.	1,380,000	All except Canal Zone, Del., La., Mass., Mo., Oreg., Puerto Rico, S.C., Va., Virgin Islands.	N.Y.—D.C., Tex.
American General Insurance Company, Houston, Tex.	3,886,000	Ala., Ariz., Ark., Colo., D.C., Fla., La., Miss., N. Mex., Okla., Pa., Tex.	TEX.—All except Conn., Del., Hawaii, eKy., Me., Md., Mass., Mich., N.H., N.J., N.Y., Puerto Rico, R.I., eTenn., Vt., Virgin Islands.
American Guarantee and Liability Insurance Company, Chicago, Ill.	977,000	All except Canal Zone, Hawaii, Puerto Rico, Virgin Islands.	N.Y.—Alaska, Cal., Conn., D.C., nFla., nsGa., nsIll., nInd., Me., Md., Mass., eMich., Minn., Mo., N.H., N.J., N. Mex., Ohio, Pa., nswTex., Vt.
American Home Assurance Company, New York, N.Y.	2,533,000	Ala., Alaska, Ariz., Ark., Cal., Colo., Conn., Del., D.C., Fla., Ga., Hawaii, Ill., Ind., Iowa, Kans., Ky., La., Me., Md., Mass., Mich., Minn., Miss., Mo., Mont., Nebr., Nev., N.H., N.J., N. Mex., N.Y., N.C., N. Dak., Ohio, Okla., Pa., R.I., S.C. (fidelity only), S. Dak., Tex., Utah, Vt., Va., Wash., W. Va., Wis., Wyo.	N.Y.—D.C.
American Indemnity Company, Galveston, Tex.	554,000	Ala., Cal., Colo., D.C., Fla., Ga., Ill., Ind., Iowa, Kans., Ky., La., Mich., Minn., Miss., Mo., N.C., Ohio, Okla., S.C., Tenn., Tex., Va., Wis.	Tex.—All except Alaska, wArk., Canal Zone, Hawaii, w Mich., nOkla., Puerto Rico, Virgin Islands, wVa.
The American Insurance Company, Newark, N.J.	13,014,000	All except Canal Zone, Virgin Islands	N.J.—All except Canal Zone, Puerto Rico, Virgin Islands.
American Manufacturers Mutual Insurance Company, Chicago, Ill.	685,000	All except Canal Zone, Del., Hawaii, La., Oreg., Puerto Rico, S.C., Tenn., Virgin Islands.	N.Y.—All except Ala., Ark., nCal., Canal Zone, Conn., Del., Ga., Hawaii, Idaho, sIowa, Kans., La., Me., Md., Mo., Nebr., Nev., Oreg., mPa., Puerto Rico, S.C., S. Dak., Tenn., Tex., Utah, Va., Virgin Islands, Wis.
American Motorists Insurance Company, Chicago, Ill.	1,147,000	All except Alaska, Ark., Del., Hawaii, Idaho, Oreg., Puerto Rico, Virgin Islands, Wyo.	ILL.—All except Alaska, Ark., Canal Zone, Del., Hawaii, Idaho, Nev., N. Mex., Oreg., Puerto Rico, Tenn., Virgin Islands, Wyo.
American Mutual Liability Insurance Company, Wakefield, Mass.	4,477,000	All except Canal Zone, Puerto Rico, Virgin Islands	MASS.—D.C.
American National Fire Insurance Company, New York, N.Y.	946,000	All except Canal Zone, Conn., Del., Idaho, Kans., La., Me., Mass., Mich., N.J., N.C., N. Dak., Pa., Puerto Rico, S.C., S. Dak., Tenn., Va., Virgin Islands, Wis.	N.Y.—All.
American Re-Insurance Company, New York, N.Y.[2]	5,755,000	All except Fla., N. Mex	N.Y.—All.
American States Insurance Company, Indianapolis, Ind.	1,406,000	Colo., Ill., Ind., Iowa, Kans., Ky., Mich., Mo., Ohio, Pa., Wis.	IND.—D.C., Ill., Iowa, Ky., Mich., Ohio.
Argonaut Insurance Company, Menlo Park, Cal.	753,000	Alaska, Ariz., Ark., Cal., Colo., D.C., Hawaii, Idaho, Ill., Iowa, La., Mass., Minn., Miss., Mont., Nev., N. Mex., N. Dak., Okla., Oreg., S.C., Tex., Utah, Vt., Wash., Wyo.	CAL.—D.C., nGa., Idaho.

See footnotes at end of table.

COMPANIES HOLDING CERTIFICATES OF AUTHORITY FROM SECRETARY OF THE TREASURY UNDER ACT OF CONGRESS, APPROVED JULY 30, 1947 (6 U.S.C. 6-13) AS ACCEPTABLE SURETIES ON FEDERAL BONDS (a)—Continued

Names of companies and locations of principal executive offices	Underwriting limitations (net limit on any one risk) see footnote (b)	States and other areas in which licensed to transact a fidelity and surety business. See footnote (c)	State in which incorporated and judicial districts in which process agents have been appointed. (State of incorporation in capitals. Letters preceding names of States indicate judicial districts.) See footnote (d)
Associated Indemnity Corporation, Newark, N.J.	$1,534,000	All except Canal Zone, Puerto Rico, Virgin Islands	CAL.—nAla., Ariz., D.C., sFla., eMo., Mont., Nebr., Nev., sN.Y., wOkla., Oreg., Tex., Utah, Wash.
Atlantic Insurance Company, Dallas, Tex.	1,114,000	Ariz., Ark., Cal., Ill., Ind., Kans., Mo., Nev., N. Mex., N.C., Ohio, Okla., Tex., Utah.	TEX.—mAla., Ark., Cal., Colo., D.C., nsGa., Idaho, Ill., Ind., Kans., La., Mich., Mo., N. Mex., N.C., Ohio, Okla., S.C., Utah.
Atlantic Mutual Insurance Company, New York, N.Y.	4,028,000	All except Ala., Canal Zone, Hawaii, La., Puerto Rico, Tenn., Virgin Islands.	N.Y.—D.C.
Auto-Owners Insurance Company, Lansing, Mich.	1,395,000	Ala., Fla., Ga., Ill., Ind., Iowa, Kans., Ky., Mich., Minn., Mo., Nebr., N.C., N. Dak., Ohio, Pa., S.C., S. Dak., Tenn., Wis.	MICH.—D.C., nsFla., Ill., Ind., Iowa, Minn., Mo., N. Dak., Ohio, S. Dak.
Balboa Insurance Company, Los Angeles, Cal.	316,000	Alaska, Cal., Hawaii, Ill., Ind., Ky., Minn., Nev., N. Mex. N.C., Wyo.	CAL.—D.C.
Bankers Multiple Line Insurance Company, Chicago, Ill.	358,000	All except Alaska, Canal Zone, Del., Ga., Hawaii, Idaho, La., N.H., N.C., Oreg., Puerto Rico, S.C., Tenn., Va., Virgin Islands.	IOWA—D.C.
Bankers and Shippers Insurance Company of New York, New York, N.Y.	1,226,000	All except Canal Zone, Hawaii, Me., Puerto Rico, Virgin Islands, W. Va.	N.Y.—mAla., Ariz., Ark., Del., D.C., nFla., nGa., sInd., sIowa, eKy., Me., Mass., wMich., Minn., sMiss., wMo., N.H., N.J., sOhio, wOkla., R.I., S. Dak., nwTex., Wyo.
Beneficial Fire and Casualty Insurance Company, Los Angeles, Cal.	299,000	Alaska, Ariz., Cal., Colo., D.C., Md., Mich., Minn., Mont., Nebr., Nev., N. Mex., N.Y., Okla., R.I., Wash., Wyo.	CAL.—D.C.
Birmingham Fire Insurance Company of Pennsylvania, Pittsburgh, Pa.	675,000	All except Ark., Canal Zone, Del., Ga., Hawaii, Idaho, Mass., N.H., N.J., Puerto Rico, S.C., Tex., Virgin Islands.	PA.—D.C.
Boston Insurance Company, Boston, Mass.	3,315,000	All except Canal Zone, Idaho, Oreg.	MASS.—All except Alaska, Canal Zone, Hawaii, Idaho, N. Dak., Oreg.
The Buckeye Union Casualty Company, Columbus, Ohio.	2,197,000	Ind., Ky., Mich., Ohio, Pa., Va., W. Va.	OHIO—D.C., Ill., Ind., Ky., Mich., Minn., Pa., eTenn., Wash., W. Va.
Buffalo Insurance Company, Buffalo, N.Y.	413,000	Ala., Alaska, Ariz., Cal., Colo., Conn., D.C., Ga., Ill., Ind., Iowa, Me., Md., Mass., Mich., Minn., Miss., Mo. (fidelity only), Mont., Nebr., Nev., N.H. (reinsurance only), N.J., N. Mex., N.Y., N.C., N. Dak., Ohio, Okla., Pa., R.I., S.C. (fidelity only), Utah (fidelity only), Wash., W. Va. (surety only), Wis., Wyo.	N.Y.—D.C.
The Camden Fire Insurance Association, Camden, N.J.	2,440,000	Ala. (fidelity only), Alaska, Ariz., Ark., Colo., Conn., Ill., Ind., Iowa, Kans., Md., Mass., Mich., Nev., N.H., N.J., N. Mex., N.Y., N.C., N. Dak., Ohio, Okla., S.C. (fidelity only), Utah, Vt., Wyo.	N.J.—D.C.
Capitol Indemnity Corporation, Madison, Wis.	111,000	Iowa, Mich., Minn., Wis	WIS.—D.C., nGa., Ill., sInd., Iowa, Mich., Minn.
Cascade Insurance Company, Tacoma, Wash.	224,000	Cal., Idaho, Mont., Nev., Oreg., Utah, Wash	WASH.—All except Canal Zone, Puerto Rico, Virgin Islands.
The Celina Mutual Insurance Company, Celina, Ohio.	329,000	Colo., D.C., Ill., Ind., Kans., Ky., Md., Mich., Mo., Ohio, Pa., Va., W. Va., Wis.	OHIO—D.C.
Centennial Insurance Company, New York, N.Y.	925,000	All except Ala., Canal Zone, La., Puerto Rico, Tenn., Virgin Islands.	N.Y.—D.C.
Central Mutual Insurance Company, Van Wert, Ohio.	1,250,000	All except Ala., Ark., Canal Zone, Hawaii, Ky., La., Nebr., N. Dak., Oreg., Puerto Rico, S. Dak., Tenn., Tex., Virgin Islands, Wis.	OHIO—D.C.
Central Surety and Insurance Corporation, Kansas City, Mo.	942,000	Allexcept Canal Zone, Hawaii, Puerto Rico, Virgin Islands.	MO.—All except Virgin Islands.
The Cincinnati Insurance Company, Cincinnati, Ohio.	269,000	Ala., Fla., Ga., Ind., Ky., Ohio	OHIO—mAla., D.C., sFla., nGa, sInd., Ky.
Citizens Casualty Company of New York, New York, N.Y.	131,000	All except Canal Zone, Hawaii, Ohio, Virgin Islands	N.Y.—All except Canal Zone, Hawaii, Virgin Islands.
Citizens Insurance Company of New Jersey, Hartford, Conn.	846,000	Allexcept Canal Zone, Puerto Rico, Virgin Islands	N.J.—All except Canal Zone, Hawaii, Puerto Rico, Virgin Islands.
Commercial Insurance Company of Newark, N.J., Newark, N.J.	2,089,000	Ala., Alaska, Ariz., Ark., Cal., Canal Zone, Colo., Conn., Del., D.C., Fla., Ga., Guam, Hawaii, Idaho, Ill., Ind., Iowa, Kans., Ky., La., Me., Md., Mass., Mich., Minn., Miss., Mo., Mont., Nebr., Nev., N.H., N.J., N. Mex., N.Y., N.C., N. Dak., Ohio, Okla., Oreg., Pa., R.I., S.C., S. Dak., Tenn., Tex., Utah, Vt., Va., Virgin Islands, Wash., W. Va., Wis., Wyo.	N.J.—All.
Commercial Standard Insurance Company, Fort Worth, Tex.	363,000	Ala., Ariz., Ark., Cal., Colo., D.C., Ill., Ind., Iowa, Kans., Ky., La., Minn., Mo., Mont., Nebr., Nev., N. Mex., N.C., N. Dak., Okla., S. Dak., Tenn., Tex., Utah, Va., Wyo.	TEX.—All except Alaska, Canal Zone, Hawaii, Minn., Miss., Puerto Rico, S. Dak., Virgin Islands.
Commercial Union Insurance Company of New York, New York, N.Y.[2]	6,301,000	All except Canal Zone, Virgin Islands	N.Y.—All except Canal Zone, Virgin Islands, Wyo.
The Connecticut Fire Insurance Company, Hartford, Conn.	7,333,000	All except Canal Zone, Puerto Rico, Virgin Islands	CONN.—All except Alaska, Canal Zone, Hawaii, Puerto Rico, Virgin Islands.
The Connecticut Indemnity Company, New Haven, Conn.	798,000	All except Alaska, Canal Zone, Del., Hawaii, Oreg., Puerto Rico, S.C., Va., Virgin Islands.	CONN.—All except Alaska, Ariz., Cal., Canal Zone, Hawaii, Idaho, Mont., Nev., Oreg., Puerto Rico, Utah, Virgin Islands, Wash.
Consolidated Mutual Insurance Company, Brooklyn, N.Y.	1,042,000	All except Ala., Alaska, Ariz., Canal Zone, Del., Kans., La., S.C.	N.Y.—D.C.
Continental Casualty Company, Chicago, Ill.	31,995,000	All	ILL.—All except Canal Zone, Virgin Islands.
The Continental Insurance Company, New York, N.Y.	106,898,000	All except Hawaii, Oreg., Puerto Rico, Virgin Islands	N.Y.—All except Canal Zone, Puerto Rico, Virgin Islands.
Cosmopolitan Mutual Insurance Company, New York, N.Y.	1,195,000	Cal., Conn., D.C., Fla., Ga., Ill., Ind., Mo., Md., Mass., N.H., N.J., N.Y., Pa., R.I., Vt., Va., W. Va.	N.Y.—D.C.
Emmco Insurance Company, South Bend, Ind.	1,756,000	Alaska, Ind., Iowa, N.Y., Vt., Wyo	IND.—D.C.
Empire Fire and Marine Insurance Company, Omaha, Nebr.	75,000	Ala., Alaska, Ariz., Colo., Ill., Iowa, Minn., Miss., Mo., Mont., Nebr., Nev., N. Mex., N. Dak., Okla., S. Dak., Utah, Wash., Wyo.	NEBR.—
Employers Casualty Company, Dallas, Tex.	803,000	Ariz., Ark., Cal., Colo., Ill., Ind., Iowa, Kans., Minn., Miss., Mo., Mont., Nebr., Nev., N. Mex., Tex., Utah, Wash., Wyo.	TEX.—D.C.
The Employers' Fire Insurance Company, Boston, Mass.	1,628,000	All except Canal Zone	MASS.—All except Canal Zone.
Employers Mutual Casualty Company, Des Moines, Iowa.	1,786,000	All except Ala., Canal Zone, Conn., Del., Fla., Ga., Hawaii, Ky., La., Mass., Mont., Nev., Puerto Rico, R.I., Tenn., Utah, Virgin Islands.	IOWA—Alaska, Colo., D.C., Ill., Ind., Kans., Md., Minn., Miss., Mo., Nebr., N.C., N. Dak., Ohio, Okla., Oreg., Pa., S.C., S. Dak., Wis.
Employers Mutual Liability Insurance Company of Wisconsin, Wausau, Wis.	9,795,000	All except Canal Zone, Virgin Islands	WIS.—D.C.
Employers Reinsurance Corporation, Kansas City, Mo.	4,015,000	All except Canal Zone, Hawaii, Puerto Rico, Virgin Islands.	MO.—All.

See footnotes at end of table.

Companies Holding Certificates of Authority From Secretary of the Treasury Under Act of Congress, Approved July 30, 1947 (6 U.S.C. 6-13) as Acceptable Sureties on Federal Bonds (a)—Continued

Names of companies and locations of principal executive offices	Underwriting limitations (net limit on any one risk) see footnote (b)	States and other areas in which licensed to transact a fidelity and surety business. See footnote (c)	State in which incorporated and judicial districts in which process agents have been appointed. (State of incorporation in capitals. Letters preceding names of States indicate judicial districts.) See footnote (d)
Equitable Fire and Marine Insurance Company, Providence, R.I.	$2,320,000	All except Alaska, Ark., Canal Zone, Del., Idaho, La., Me., Nev., Oreg., Puerto Rico, S.C., Virgin Islands.	R.I.—All except Alaska, Canal Zone, Hawaii, Puerto Rico, Virgin Islands.
Export Insurance Company, Houston, Tex.	341,000	Ariz., Ark., Cal., Ill., Iowa, Md., Mont., Nev., N.Y., Okla., Tex., Vt., W. Va., Wyo.	N.Y.—
Farmers Elevator Mutual Insurance Company, Des Moines, Iowa.	312,000	Colo., Ill., Iowa, Kans., Minn., Nebr., N. Dak., Okla., S. Dak., Tex., Wis., Wyo.	IOWA—Colo., D.C., Ill., Kans., Nebr., Okla., S. Dak.
Farmers Mutual Hail Insurance Company of Iowa, Des Moines, Iowa.	1,045,000	Iowa	IOWA—
Federal Insurance Company, New York, N.Y.	14,978,000	All	N.J.—All.
Federated Mutual Implement and Hardware Insurance Company, Owatonna, Minn.	965,000	All except Alaska, Cal., Canal Zone, Del., Hawaii, Idaho, La., Me., Mass., Nev., Oreg., Pa., Puerto Rico, Tex., Virgin Islands, Wis.	MINN.—Ala., Ark., D.C., Fla., Ga., Ky., Miss., N.C., Okla., S.C., Tenn., Va., W. Va.
The Fidelity and Casualty Company of New York, New York, N.Y.	13,065,000	All except Virgin Islands	N.Y.—All except Hawaii, Puerto Rico, Virgin Islands.
Fidelity and Deposit Company of Maryland, Baltimore, Md.	6,723,000	All	MD.—All.
Fidelity-Phenix Insurance Company, New York, N.Y.	3,989,000	All except Canal Zone, Oreg., Virgin Islands	N.Y.—All except Virgin Islands.
Fireman's Fund Insurance Company, San Francisco, Cal.	36,351,000	All except Canal Zone	CAL.—All.
Firemen's Insurance Company of Newark, New Jersey, Newark, N.J.	12,811,000	All except Puerto Rico	N.J.—All except Canal Zone.
First Insurance Company of Hawaii, Limited, Honolulu, Hawaii.	632,000	Guam, Hawaii, Oreg	HAWAII—D.C.
The Fulton Insurance Company, New York, N.Y.	250,000	All except Ala., Del., Ga., Hawaii, Idaho	N.Y—All except Ala., Canal Zone, Del., Ga., Idaho, Puerto Rico, Virgin Islands, eWash.
General Fire and Casualty Company, New York, N.Y.	690,000	All except Ala., Alaska, Ariz., Ark., Canal Zone, Conn., Del., Ga., Hawaii., Idaho, Kans., Me., Mont., N. Mex., N. Dak., Oreg., Puerto Rico, S.C., S. Dak., Tenn., Virgin Islands, Wash., Wyo.	N.Y.—D.C.
General Insurance Company of America, Seattle, Wash.	13,305,000	All except Puerto Rico, Virgin Islands	WASH.—All except Puerto Rico, Virgin Islands.
General Reinsurance Corporation, New York, N.Y.	7,369,000	All except Canal Zone, Hawaii, Puerto Rico, Virgin Islands.	N.Y.—All except Canal Zone, Virgin Islands.
Glens Falls Insurance Company Glens Falls, N.Y.	7,336,000	All except Canal Zone, Puerto Rico, Virgin Islands	N.Y.—All except Puerto Rico, Virgin Islands.
Globe Indemnity Company, New York, N.Y.	6,131,000	All except Canal Zone, Puerto Rico, Virgin Islands	N.Y.—All except Alaska, Virgin Islands.
Grain Dealers Mutual Insurance Company, Indianapolis, Ind.	1,268,000	All except Ala., Alaska, Canal Zone, Del., Hawaii, Idaho, Me., Nev., Oreg., Puerto Rico, S.C., Tenn., Virgin Islands.	IND.—eArk., Colo., D.C., Ill., Iowa, Kans., Nebr., Ohio, wOkla.
Granite State Insurance Company, Manchester, N.H.	649,000	All except Canal Zone, Del., Hawaii, Idaho, Oreg., Puerto Rico, Virgin Islands.	N.H.—All except Puerto Rico.
Great American Insurance Company, New York, N.Y.	25,829,000	All except Canal Zone	N.Y.—All.
Great Northern Insurance Company, Minneapolis, Minn.	615,000	Ariz., Ill., Iowa., Minn., Mo., Mont., Nebr., Nev., N.Y., N. Dak., S. Dak., Wis., Wyo.	MINN.—D.C., nsIll., Iowa, Mo., Mont., N. Dak., S. Dak., Wis.
Greater New York Mutual Insurance Company, New York, N.Y.	1,401,000	Conn., D.C., Fla., Ga., Ind., Me., Md., Mass., Minn., Miss., N.H., N.J., N.Y., N.C., Okla., Pa., R.I., Tenn., Vt., Va., Wis.	N.Y.—
Guarantee Insurance Company, New York, N.Y.	496,000	Alaska, Ariz., Ark., Cal. Colo., Fla., Hawaii, Idaho, Ind., Iowa., N.J., N. Mex., N.Y., N.C., Okla., Utah, Va., Wash., Wyo.	CAL.—D.C.
Gulf American Fire and Casualty Company, Montgomery, Ala.	119,000	Ala., Fla., Ga., La., Miss., S.C., Tenn	ALA.—D.C., mnGa., sMiss.
Gulf Insurance Company, Dallas, Tex.	6,058,000	Ariz., Ark., Cal., Colo., Ill., Ind., Kans., La., Mich., Mo., Nev., N. Mex., N.C., Ohio, Okla., Pa., Tex., Utah, Wyo.	TEX.—mAla., Ark., Cal., Colo., D.C., nsGa., Idaho, Ill., Ind., Kans., La., Mich., Mo., N. Mex., N.C., Ohio, Okla., S.C., Utah.
The Hanover Insurance Company, New York, N.Y.	5,073,000	All except Canal Zone, Puerto Rico, Virgin Islands	N.Y.—All.
Hardware Mutual Casualty Company, Stevens Point, Wis.	1,158,000	All except Canal Zone, Idaho, Puerto Rico, Virgin Islands	WIS.—D.C.
Hartford Accident and Indemnity Company, Hartford, Conn.	23,904,000	All	CONN.—All except Virgin Islands.
Hartford Fire Insurance Company, Hartford, Conn.	55,459,000	All except Canal Zone, Puerto Rico	CONN.—Ariz., Cal., D.C., La., N.Y.
Hawkeye-Security Insurance Company, Des Moines, Iowa.	757,000	Colo., D.C., Fla., Idaho, Ill., Ind., Iowa, Kans., Md., Mich., Minn., Mo., Mont., Nebr., Nev., N. Mex., Ohio, Pa., S. Dak., Utah, Va., Wyo.	IOWA—Colo., D.C., Fla., Ill., sInd., Kans., wMich., Mo., Nebr., N. Mex., S. Dak., Wyo.
The Home Indemnity Company, New York, N.Y.	6,743,000	All except Alaska, Canal Zone, Hawaii, Puerto Rico, Virgin Islands.	N.Y.—All except Alaska, Hawaii, Puerto Rico, Virgin Islands.
The Home Insurance Company, New York, N.Y.	31,910,000	All except Canal Zone	N.Y.—D.C., Puerto Rico.
Home Owners Insurance Company, Chicago, Ill.	141,000	Ariz., Fla., Ill., Ind., Minn., Tenn	ILL.—Ariz., D.C., sFla., Minn.
Hudson Insurance Company, New York, N.Y.	365,000	N.Y	N.Y.—D.C.
Illinois National Insurance Co., Springfield, Ill.	355,000	Ill., Ind., Iowa, Kans., Ky., Mich., Minn., Mo., Nebr., Ohio.	ILL.—All except Canal Zone, Puerto Rico, Virgin Islands.
Industrial Indemnity Company, San Francisco, Cal.	1,305,000	Alaska, Ariz., Ark., Cal., Colo., Fla., Guam, Hawaii, Idaho, Ill., La., Miss., Mo., Mont., Nebr., Nev., N. Mex., N.C., Okla., Oreg., S. Dak., Tex., Utah, Wash., Wyo.	CAL.—Alaska, Ariz., eArk., Colo., D.C., sFla., Hawaii, Idaho, nIll., eLa., eMo., Mont., Nebr., Nev., N. Mex., wOkla., Oreg., S. Dak., Tex., Utah, Wash., Wyo.
Inland Insurance Company, Lincoln, Nebr.	296,000	Minn., Nebr., S. Dak	NEBR.—Ariz., Ark., Colo., D.C., Ill., Iowa, Kans., Ky., Minn., eMo., Mont., Nev., N. Mex., N. Dak., Ohio, Okla., Oreg., S. Dak., Tex., Utah, Wash., Wyo.
Insurance Company of North America, Philadelphia, Pa.	72,833,000	All	PA.—All.
Insurance Company of the State of Pennsylvania, Philadelphia, Pa.	995,000	Ala., Alaska, Ark., Cal., Colo., Conn., Del., D.C., Fla., Ga., Hawaii, Ill., Ind., Iowa, Kans., Ky., La., Me., Md., Mass., Mich., Minn., Miss., Mo., Mont., Nebr., Nev., N.H., N.J., N. Mex., N.Y., N.C., Ohio, Okla., Pa., R.I., S.C. (fidelity only), Tex., Utah., Vt., Va., Wash., W. Va., Wis., Wyo.	PA.—D.C.
International Fidelity Insurance Company, Jersey City, N.J.	46,000	Md., Mass., Mich. (fidelity only), N.J., N.Y., Pa	N.J.—All except Alaska, Virgin Islands.
Iowa Mutual Insurance Company, DeWitt, Iowa.	295,000	Ala., Colo., Fla., Ga., Ill., Iowa, Kans., La., Minn., Mo., Mont., Nebr., N.C., N. Dak., Okla., Oreg., S.C., S. Dak., Wis., Wyo.	IOWA—nAla., Colo., D.C., sIll., Kans., Minn., Mont., Nebr., wN.C., wOkla., Oreg., S. Dak.

See footnotes at end of table.

Companies Holding Certificates of Authority From Secretary of the Treasury Under Act of Congress, Approved July 30, 1947 (6 U.S.C. 6-13) as Acceptable Sureties on Federal Bonds (a)—Continued

Names of companies and locations of principal executive offices	Underwriting limitations (net limit on any one risk) see footnote (b)	States and other areas in which licensed to transact a fidelity and surety business. See footnote (c)	State in which incorporated and judicial districts in which process agents have been appointed. (State of incorporation in capitals. Letters preceding names of States indicate judicial districts.) See footnote (d)
Jersey Insurance Company of New York, New York, N.Y.	$800,000	All except Alaska, Ariz., Canal Zone, Del., Hawaii, Me., Nev., N.H., N. Mex., N. Dak., Puerto Rico, Vt., Virgin Islands, W. Va., Wyo.	N.Y.—mAla., Ariz., Ark., D.C., nFla., nGa., sInd., sIowa, eKy., Mass., wMich., Minn., sMiss., wMo., N.J., sOhio, wOkla., R.I., S. Dak., nwTex.
The Kansas Bankers Surety Company, Topeka, Kans.	84,000	Kans.	KANS.—D.C.
Kansas City Fire and Marine Insurance Company, Kansas City, Mo.	447,000	All except Canal Zone, Del., Hawaii, Oreg., Puerto Rico, Virgin Islands.	MO.—Ala., Ark., Colo., D.C., Fla., Ga., Ill., Iowa, Kans., Minn., Nebr., Okla., S.C., Tex., Va., Wis., Wyo.
Lawyers Surety Corporation, Dallas, Tex.	50,000	Tex.	TEX.—D.C.
Liberty Mutual Insurance Company, Boston, Mass.	17,423,000	All except Virgin Islands	MASS.—All except Canal Zone.
Lumbermens Mutual Casualty Company, Chicago, Ill.	6,250,000	All except Canal Zone, Puerto Rico, Virgin Islands	ILL.—All except Alaska, Canal Zone, Hawaii, La., Puerto Rico, Virgin Islands.
Maine Bonding and Casualty Company, Portland, Me.	294,000	Ala., Ark., Colo., Fla., Ky., Me., Mass., N.H., N. Mex., N.Y., Oreg., Tenn., Tex., Vt., Va., Wash.	ME.—Conn., D.C., Mass., N.H., R.I., Vt.
The Manhattan Fire and Marine Insurance Company, New York, N.Y.	1,409,000	All except Ark., Canal Zone, Conn., Del., La., Me., Mich., Mont., N. Dak., Oreg., Puerto Rico, S.C., Tenn., Tex., Virgin Islands.	N.Y.—D.C.
Maryland Casualty Company, Baltimore, Md.	14,234,000	All	MD.—All.
Maryland National Insurance Company, Bel Air, Md.	141,000	Ariz., Fla., Ga., Ill., Ind., La., Md., Mich., Minn., Mo., Nev., N. Dak., Ohio, Okla., Oreg., S.C., Tenn., Tex., Va., Wash., W. Va.	MD.—
Massachusetts Bay Insurance Company, Boston, Mass.	309,000	Colo., Ind., Me., Md., Mass., R.I., Wyo.	MASS.—
The Mercantile Insurance Company of America, New York, N.Y.[4]	3,225,000	All except Canal Zone, Conn., Del., Idaho, La., N.J., Oreg., Puerto Rico, Virgin Islands.	N.Y.—All except Canal Zone, Hawaii, Puerto Rico, Virgin Islands.
Merchants Fire Assurance Corporation of New York, New York, N.Y.	6,927,000	All except Alaska, Ark., Canal Zone, Del., Fla., Ga., Hawaii, Idaho, Kans., La., Me., Mont., Nev., N. Dak., Oreg., Puerto Rico, S.C., S. Dak., Tex., Vt., Va., Virgin Islands, Wyo.	N.Y.—Cal., D.C., Fla., nIll., eLa., Me., Md., Mass., Mich., Minn., wN.C., N. Dak., Oreg., ePa., eS.C., wsTex., Vt., eVa., wWash.
Merchants Indemnity Corporation of New York, New York, N.Y.	3,042,000	Cal., Conn., D.C., Ga., Ill., Ind., Iowa, Md., Mich., Minn., Mo., Nebr., N.J., N.Y., Ohio, Okla., Pa., Utah, Wash., Wis.	N.Y.—D.C., nGa., N.J., Ohio, wWash.
Michigan Millers Mutual Insurance Company, Lansing, Mich.	1,018,000	All except Ala., Alaska, Ariz., Canal Zone, Ga., Hawaii, Idaho, La., Nev., N. Mex., Oreg., Puerto Rico, S.C., Virgin Islands, Wyo.	MICH.—eArk., Cal., Colo., D.C., Ill., Ind., Iowa, Kans. eKy., Minn., Miss., Mo., Mont., Nebr., nwN.Y., N. Dak., Ohio, wOkla., S. Dak., wmTenn., Utah, wWash.
Michigan Mutual Liability Company, Detroit, Mich.	1,088,000	All except Canal Zone, Del., Hawaii, La., Me., Oreg., Puerto Rico, Tex., Virgin Islands, W. Va., Wyo.	MICH.—D.C.
Mid-Century Insurance Company, Los Angeles, Cal.	928,000	All except Ala., Alaska, Canal Zone, Conn., Del., D.C., Hawaii, Ky., La., Me., Md., Mass., Miss., N.H., N.J., N.Y., N.C., Pa., Puerto Rico. R.I., S.C., Tenn., Va., Virgin Islands, W. Va.	CAL.—Ariz., Colo., D.C., Idaho, Mont., Nebr., Nev., N. Mex., Utah, Wash., Wyo.
The Millers Mutual Fire Insurance Company, Harrisburg, Pa.	335,000	Ga., Ind., N.Y., N.C., Pa., S.C., Vt.	PA.—D.C.
The Millers Mutual Fire Insurance Company of Texas, Fort Worth, Tex.	586,000	All except Ala., Alaska, Canal Zone, Conn., Del., Hawaii, Idaho, Me., Md., Nev., N.J., N.C., Puerto Rico, R.I., S.C., Vt., Va., Virgin Islands, Wash., Wyo.	TEX.—All except Ala., Alaska, Canal Zone, Conn., Del., Hawaii, Idaho, nIowa, Me., Md., eMich., Nev., N.H., N.J., nwN.Y., N.C., mPa., Puerto Rico, R.I., S.C., Vt., Va., Virgin Islands, Wash., W. Va., eWis., Wyo.
Millers' Mutual Insurance Association of Illinois, Alton, Ill.	1,224,000	Ark., Colo., Ill., Ind., Iowa, Kans., Md., Mich., Minn., Mo., Mont., N.Y., N.C., N. Dak., Ohio, Okla., Pa., S.C., S. Dak., Tex., Vt., Wash., W. Va., Wis., Wyo.	ILL.—nmAla., Ark., Colo., D.C., Ind., Iowa, Kans., Minn., Mo., Mont., N. Dak., S. Dak.
Millers National Insurance Company, Chicago, Ill.	431,000	Ala., Ariz., Ark., Cal., Colo., Conn., D.C., Fla., Ga., Idaho, Ill., Ind., Iowa, Kans., Ky., Md., Mass., Mich., Minn., Mo., Mont., Nebr., Nev., N.H. (reinsurance only), N.J., N. Mex., N.Y., N.C., N. Dak., Ohio, Okla., Oreg., Pa., R.I., S.C., S. Dak., Tex., Utah, Wash., W. Va., Wis., Wyo.	ILL.—Ariz., sCal., Colo., D.C., Ind., Iowa, Kans., Ky., Mass., Mich., Minn., Mo., Mont., Nev., N. Mex., N. Dak., R.I., S. Dak., nwsTex., Utah, wWis., Wyo.
Milwaukee Insurance Company of Milwaukee, Wis., Milwaukee, Wis.	2,700,000	All except Canal Zone, Puerto Rico, Virgin Islands	WIS.—All.
Mutual Boiler and Machinery Insurance Company, Waltham, Mass.	1,435,000	Alaska, Ariz., Cal., Colo., Conn., D.C., Ind., Iowa, Ky., Mass., Mich., Minn., Mont., Nev., N.H., N.J., N. Mex., N.Y., N.C., R.I., Tex., Utah., Vt., W. Va., Wis., Wyo.	MASS.—D.C.
National Automobile and Casualty Insurance Company, Los Angeles, Cal.	337,000	Alaska., Ariz., Ark., Cal., Colo., Idaho., Ill., Ind., Kans., Ky., La., Mich., Mo., Mont., Nev., N. Mex., Okla., Oreg., Tenn., Tex., Utah. Wash., Wyo.	CAL.—All except Canal Zone, Hawaii, Puerto Rico, Virgin Islands.
National-Ben Franklin Insurance Company of Pittsburgh, Pa., Pittsburgh, Pa.	1,225,000	All except Canal Zone, Hawaii, Oreg., Puerto Rico, Virgin Islands.	PA.—D.C., Md.
National Casualty Company, Detroit, Mich.	1,000,000	All except Canal Zone, Hawaii, Puerto Rico, S.C., Virgin Islands.	MICH.—All except Alaska, Canal Zone, Hawaii, Puerto Rico, Virgin Islands.
National Fire Insurance Company of Hartford, Hartford, Conn.	9,057,000	All except Canal Zone, Virgin Islands	CONN.—All except Alaska, Ariz., Canal Zone, Hawaii, Idaho, Nev., N.Y., Vt., Virgin Islands.
National Grange Mutual Insurance Company, Keene, N.H.	2,089,000	Conn., D.C., Fla., Ill., Ind., Me., Md., Mass., Mich., Minn., N.H., N.J., N.Y., N.C., Ohio, Pa., R.I., S.C., Vt., W. Va., Wis.	N.H.—All except Alaska, Canal Zone, Hawaii, Virgin Islands.
National Indemnity Company, Omaha, Nebr.	430,000	All except Canal Zone, Conn., Fla., Ga., Hawaii, Me., Mass., N.H., N.J., N.Y., Ohio, Oreg., Puerto Rico, R.I., S.C., Vt., Virgin Islands.	NEBR.—All except Alaska, Canal Zone, Hawaii, Puerto Rico, Virgin Islands.
National Standard Insurance Company, Houston, Tex.	276,000	Colo., La., N. Mex., Tex.	TEX.—D.C.
National Surety Corporation, Principal Office: New York, N.Y.; Home Office: San Francisco, Cal.	5,459,000	All except Puerto Rico, Virgin Islands	N.Y.—All.
National Union Fire Insurance Company of Pittsburgh, Pa., Pittsburgh, Pa.	3,617,000	All except Canal Zone, Hawaii, Idaho, Puerto Rico, Virgin Islands.	PA.—All except Alaska, Canal Zone, Puerto Rico, Virgin Islands.
National Union Indemnity Company, Pittsburgh, Pa.	595,000	All except Ark., Canal Zone, Hawaii, Idaho, Me., Oreg., Puerto Rico, Virgin Islands.	PA.—All except Alaska, Canal Zone, Puerto Rico, Virgin Islands.
Nationwide Mutual Insurance Company, Columbus, Ohio.	3,427,000	All except Cal., Canal Zone, Hawaii, Nebr., N. Mex., Virgin Islands, Wis.	OHIO—D.C.
New Amsterdam Casualty Company, Baltimore, Md.	5,144,000	All except Canal Zone, Idaho, Virgin Islands	N.Y.—All except Canal Zone, Virgin Islands.
New Hampshire Insurance Company, Manchester, N.H.	3,683,000	All except Canal Zone, Puerto Rico, Virgin Islands	N.H.—All.
New York Underwriters Insurance Company, New York, N.Y.	1,988,000	All except Canal Zone, Puerto Rico, Virgin Islands	N.Y.—All except Canal Zone, Puerto Rico, Virgin Islands.
Newark Insurance Company, Milford, N.J.	1,768,000	All except Canal Zone, Oreg., Puerto Rico, Virgin Islands.	N.J.—All except Alaska, nCal., Canal Zone, Hawaii, Idaho, Virgin Islands, Wyo.
Niagara Fire Insurance Company, New York, N.Y.	23,640,000	All except Canal Zone, Hawaii, Oreg.	N.Y.—All except Canal Zone, Puerto Rico, Virgin Islands.

See footnotes at end of table.

COMPANIES HOLDING CERTIFICATES OF AUTHORITY FROM SECRETARY OF THE TREASURY UNDER ACT OF CONGRESS, APPROVED JULY 30, 1947 (6 U.S.C. 6-13) AS ACCEPTABLE SURETIES ON FEDERAL BONDS (a)—Continued

Names of companies and locations of principal executive offices	Under-writing limitations (net limit on any one risk) see footnote (b)	States and other areas in which licensed to transact a fidelity and surety business. See footnote (c)	State in which incorporated and judicial districts in which process agents have been appointed. (State of incorporation in capitals. Letters preceding names of States indicate judicial districts.) See footnote (d)
North American Reinsurance Corporation, New York, N.Y.	$3,802,000	All except Canal Zone, N. Dak., Puerto Rico, S. Dak., Tenn., Virgin Islands.	N.Y.—All except Canal Zone, Puerto Rico, Virgin Islands.
The North River Insurance Company, New York, N.Y.	5,947,000	All except Canal Zone, Hawaii, Puerto Rico, Virgin Islands.	N.Y.—All except Alaska, Canal Zone, Hawaii, Puerto Rico Virgin Islands.
Northeastern Insurance Company of Hartford, Des Moines, Iowa.	1,031,000	Cal., Colo., Conn., Ill., Iowa, Mich., N.H., N.J., N.Y., Ohio, Okla., Tex.	CONN.—D.C.
The Northern Assurance Company of America, Boston, Mass.	1,054,000	All except Canal Zone, Virgin Islands	MASS.—All except Canal Zone, Minn., eTenn., Virgin Islands, sW. Va.
Northern Insurance Company of New York, New York, N.Y.	4,067,000	All except Ark., Canal Zone, Conn., Fla., Hawaii, Ind., Kans., La., N.H., Oreg., Puerto Rico, S.C., Tenn., Va., Virgin Islands.	N.Y.—D.C., Me.
Northwestern National Insurance Company, Milwaukee, Wis.	5,254,000	Ariz., Cal., Colo., D.C., Ga., Ill., Ind., Iowa, Kans., Md., Mich., Minn., Mont., Nebr., N.J., N. Mex., N.C., N. Dak., Ohio, Okla., Pa., R.I., Tex., Utah, Wash., Wis.	WIS.—All except Ala., Alaska, Canal Zone, Del., Fla., Ga., Hawaii, Idaho, Kans., Ky., La., Me., Mass., eMich., Miss., Mont., Nebr., Nev., N.H., N.J., N. Dak., Puerto Rico, S.C., Tenn., Vt., Virgin Islands, Wis., Wyo.
The Ohio Casualty Insurance Company, Hamilton, Ohio.	3,200,000	All except Alaska, Canal Zone, Hawaii, Idaho, Me., N.Y., Puerto Rico, Virgin Islands.	OHIO—All except Canal Zone, Hawaii, Virgin Islands.
Ohio Farmers Insurance Company, LeRoy, Ohio.	1,755,000	Ariz., Cal., Colo., Conn., Del., D.C., Ill., Ind., Iowa, Md., Mass., Mich., Minn., Mo., Nev., N.J., N.Y., N. Dak., Ohio, Okla., Pa., R.I., S. Dak., Va., W. Va., Wis.	OHIO—Ariz., Ark., Cal., Colo., Conn., D.C., Fla., Idaho, Ill., Ind., Iowa, Ky., Md., Mass., wMich., Minn., Nev., N.J., N. Mex., nsN.Y., N.C., Okla., Oreg., emPa., Tex., Utah, eVa., Wash., W. Va., Wis.
Old Colony Insurance Company, Boston, Mass.	771,000	All except Canal Zone, Hawaii, Idaho, Oreg., S. Dak., Virgin Islands.	MASS.—All except Alaska, Canal Zone, Hawaii, Idaho, Nev., N. Dak., Oreg., Virgin Islands.
Oregon Automobile Insurance Company, Portland, Oreg.	408,000	Cal., Idaho, Nev., Oreg., Utah, Wash	OREG.—nCal., D.C., Idaho, Nev., Utah, Wash.
Pacific Employers Insurance Company, Los Angeles, Cal.	1,039,000	All except Ala., Ark., Canal Zone, Conn., D.C., Fla., Ga., Hawaii, Ky., La., Me., Md., Mass., Mich., N.H., N.Y., N.C., N. Dak., Pa., Puerto Rico, R.I., S.C., Vt., Va., Virgin Islands, W. Va., Wis.	CAL.—Ariz., Conn., Del., D.C., sFla., wKy., Md., Mass., N. Mex., N.Y., Ohio, R.I., wTex., W. Va., Wis.
Pacific Indemnity Company, Los Angeles, Cal.	2,781,000	All except Canal Zone, Puerto Rico, Virgin Islands	CAL.—All except Conn., Me., N.H., Vt., Virgin Islands.
Pacific Insurance Company, Limited, Honolulu, Hawaii.	291,000	Hawaii	HAWAII—D.C.
Pacific Insurance Company of New York, New York, N.Y.	1,751,000	All except Alaska, Canal Zone, Hawaii, Me., Nev., N.H., N. Dak., Puerto Rico, S. Dak., Vt., Virgin Islands, W. Va., Wyo.	N.Y.—nAla., Ariz., Ark., Del., D.C., nFla., nGa., sInd., sIowa, eKy., Me., Mass., wMich., Minn., sMiss., wMo., N.J., sOhio, wOkla., R.I., SsDak., nwTex., Wyo.
Peerless Insurance Company, Keene, N.H.	816,000	All except Canal Zone, Hawaii, Puerto Rico	N.H.—All except Hawaii, Virgin Islands.
The Pennsylvania Insurance Company, Philadelphia, Pa.	2,115,000	All except Canal Zone, Puerto Rico, Virgin Islands	PA.—All except Canal Zone, Puerto Rico, Virgin Islands.
Pennsylvania Manufacturers' Association Casualty Insurance Company, Philadelphia, Pa.	1,476,000	Del., D.C., Md., N.J., N.Y., Ohio, Pa., W. Va	PA.—D.C.
Pennsylvania Millers Mutual Insurance Company, Wilkes-Barre, Pa.	1,122,000	Pa., D.C	PA.—D.C.
Pennsylvania National Mutual Casualty Insurance Company, Harrisburg, Pa.	1,151,000	Ala., D.C., Ga., Ill., Ind., Iowa, Kans., Ky., Md., Mich., Minn., Miss., Mo., Nebr., N.J., N.C., Okla., Pa., R.I., S.C., Tenn., Tex., Utah, Vt., Va., W. Va., Wis.	PA.—D.C., Kans., Md., Mo., N.J., N.C., Okla., Tenn., Va.
Phoenix Assurance Company of New York, New York, N.Y.	1,625,000	All except Canal Zone, Puerto Rico, Virgin Islands	N.Y.—All except Alaska, Canal Zone, Puerto Rico, Virgin Islands.
The Phoenix Insurance Company, Hartford, Conn.	15,936,000	All except Canal Zone, Puerto Rico, Virgin Islands	CONN.—All except Alaska, Canal Zone, Hawaii, Puerto Rico, Virgin Islands.
Planet Insurance Company, Philadelphia, Pa.	1,547,000	All except Canal Zone, Hawaii, Puerto Rico, Virgin Islands.	WIS.—All except Canal Zone, Virgin Islands.
Potomac Insurance Company, Philadelphia, Pa.	4,378,000	Ala. (fidelity only), Ariz., Cal., Colo., Conn., D.C., Fla., Ga., Ill., Ind., Iowa, Kans., Ky., La., Md., Mass., Mich., Minn., Miss., Mo., Nebr., N.J., N. Mex., N.Y., N.C., Ohio, Okla., Pa., R.I., S.C. (fidelity only), Tenn., Tex., Utah, Va., Wash., W. Va., Wis., Wyo.	PA.—All except Ala., Alaska, Ariz., Ark., Canal Zone, Del., sGa., Hawaii, Idaho, eIll., nInd., nIowa, eKy., Me., nMiss., Mont., Nev., N.H., N. Dak., Oreg., Puerto Rico, S.C., S. Dak., Vt., Va., Virgin Islands.
Progressive Mutual Insurance Company, Cleveland, Ohio.	275,000	Ohio	OHIO—D.C.
Providence Washington Insurance Company, Providence, R.I.	1,639,000	All except Canal Zone, Del., Idaho, La., N.C., N. Dak., Oreg., Puerto Rico, Virgin Islands.	R.I.—Conn., D.C., Mass., N.H., N.J., N.Y., Pa., Vt.
Provident Insurance Company of New York, New York, N.Y.	414,000	All except Ariz., Canal Zone, Conn., Del., Ga., Hawaii, Idaho, Kans., La., Me., Miss., Mont., Oreg., Puerto Rico., S.C., Virgin Islands.	N.Y.—sCal., D.C., eN.C., Tenn., Va., W. Va.
The Prudential Insurance Company of Great Britain Located in New York, New York, N.Y.	945,000	Cal., N.Y., Pa	N.Y.—D.C.
Public Service Mutual Insurance Company, New York, N.Y.	1,678,000	Conn., Del., D.C., Fla., Ga., Iowa, Me., Md., N.H., N.J., N.Y., N.C., Pa., Va., W. Va.	N.Y.—D.C., sFla., ePa., wTex.
Queen Insurance Company of America, New York, N.Y.	4,486,000	All except Canal Zone, Oreg., Puerto Rico, Virgin Islands.	N.Y.—All except Alaska, Canal Zone, Hawaii, Idaho, Virgin Islands, Wyo.
The Reinsurance Corporation of New York, New York, N.Y.	2,759,000	All except Ala., Ariz., Canal Zone, Conn., Fla., Hawaii, Idaho, La., Mass., N. Mex., Oreg., Pa., Puerto Rico, S. Dak., Tenn., Tex., Utah, Va., Virgin Islands.	N.Y.—D.C.
Reliable Insurance Company, Chicago, Ill.	241,000	All except Ark., Canal Zone, Conn., Fla., Ga., Hawaii, Kans., La., Mass., Mo., N.Y., N.C., N. Dak., Oreg., Puerto Rico, R.I., Tenn., Utah, Vt., Va., Virgin Islands, Wash., W. Va.	OHIO—D.C.
Reliable Insurance Company, Philadelphia, Pa.[5]	13,211,000	All except Canal Zone, Puerto Rico, Virgin Islands	PA.—All except Canal Zone.
Republic Insurance Company, Dallas, Tex.	2,548,000	All except Ala., Alaska, Canal Zone, Del., Fla., Ga., Hawaii, Idaho, Ky., Me., Mass., Mont., Nev., N.H., N. Dak., Puerto Rico, R.I., S.C., S. Dak., Tenn., Utah, Vt., Virgin Islands, Wyo.	TEX.—D.C.
Resolute Insurance Company, Providence, R.I.	728,000	All except Canal Zone, Ky., La., N.Y., Puerto Rico, Virgin Islands.	R.I.—All except wArk., Canal Zone, msGa., Hawaii, Ky., La., Me., Mich., nMiss., nwN.Y., N.C., Oreg., Puerto Rico, S.C., S. Dak., weTenn., Utah, Vt., wVa., Virgin Islands, nW. Va., wWis.
Royal Indemnity Company, New York, N.Y.	4,753,000	All except Virgin Islands	N.Y.—All except Virgin Islands.
Safeguard Insurance Company, Hartford, Conn.	1,592,000	All except Canal Zone, Del., Puerto Rico, Virgin Islands	CONN.—All except Ark., Canal Zone, Ga., Ky., La., Miss., N.C., Okla., Puerto Rico, S.C., Tenn., nweTex., Vt., Virgin Islands, wVa., W. Va.
St. Paul Fire and Marine Insurance Company, St. Paul, Minn.	23,059,000	All except Canal Zone	MINN.—All.
St. Paul Mercury Insurance Company, St. Paul, Minn.	2,799,000	All except Canal Zone, Puerto Rico, Virgin Islands	MINN.—All.
Seaboard Surety Company, New York, N.Y.	2,395,000	All	N.Y.—All.

See footnotes at end of table.

COMPANIES HOLDING CERTIFICATES OF AUTHORITY FROM SECRETARY OF THE TREASURY UNDER ACT OF CONGRESS, APPROVED JULY 30, 1947 (6 U.S.C. 6-13) AS ACCEPTABLE SURETIES ON FEDERAL BONDS (a)—Continued

Names of companies and locations of principal executive offices	Underwriting limitations (net limit on any one risk) see footnote (b)	States and other areas in which licensed to transact a fidelity and surety business. See footnote (c)	State in which incorporated and judicial districts in which process agents have been appointed. (State of incorporation in capitals. Letters preceding names of States indicate judicial districts.) See footnote (d)
Security Insurance Company of New Haven, New Haven, Conn.	$6,428,000	All except Canal Zone, Del., Hawaii, Miss., Oreg., Puerto Rico, S.C., Virgin Islands.	CONN.—All except Ariz., Cal., Canal Zone, Hawaii, Idaho, Mont., Nev., Oreg., Puerto Rico, Utah, Virgin Islands, Wash.
Security Mutual Casualty Company, Chicago, Ill.	1,936,000	All except Alaska, Canal Zone, Hawaii, Puerto Rico, Virgin Islands.	ILL.—D.C.
Security National Insurance Company, Dallas, Tex.	342,000	Ark., Cal., Colo., Ind., Mich., Okla., Tex.	TEX.—All except Canal Zone, Mont.
Select Insurance Company, Dallas, Tex.	345,000	Colo., Fla., Tex., Wyo.	TEX.—mAla., Ark., Cal., Colo., D.C., Ga., Ill., Idaho, Ind., Kans., La., Mich., N. Mex., N.C., Okla., S.C., Utah, Wyo.
Springfield Insurance Company, Springfield, Mass.[6]	10,329,000	All except Canal Zone, Puerto Rico, Virgin Islands.	MASS.—All except Alaska, Canal Zone, Hawaii, Puerto Rico, Virgin Islands.
State Automobile Mutual Insurance Company, Columbus, Ohio.	1,982,000	Ala., Fla., Ga., Ind., Ky., Md., Mich., Miss., Mo., N.C., Ohio, Pa., S.C., Tenn., W. Va.	OHIO—D.C., Ky., Md., Mich., Tenn., W. Va.
State Fire and Casualty Company, Miami, Fla.	93,000	Del., Fla., Ill. (surety only), La., Md. (surety only)	FLA.—D.C.
State Surety Company, Des Moines, Iowa.	45,000	Iowa, Minn., Mo., Nebr.	IOWA—eArk., D.C., Ill., Mo., Nebr., N. Dak., nOhio, nOkla., S. Dak.
Statesman Insurance Company, Indianapolis, Ind.	133,000	Ill., Ind., Iowa, Pa.	IND.—D.C., Ill., wmPa.
The Stuyvesant Insurance Company, Allentown, Pa.	200,000	All except Canal Zone, Hawaii, Virgin Islands.	N.Y.—All except Alaska, Canal Zone, Hawaii, Virgin Islands.
The Summit Fidelity and Surety Company, Columbus, Ohio.	82,000	All except Ark., Cal., Canal Zone, Conn., D.C., Ga., Hawaii, Idaho, Me., Md., Mass., Miss., Mont., N.H., N.Y., N.C., Oreg., Puerto Rico, R.I., S.C., S. Dak., Texas, Virgin Islands, W. Va.	OHIO—
Sun Insurance Company of New York, New York, N.Y.	1,121,000	All except Canal Zone, Hawaii, Idaho, La., Miss., Okla., Puerto Rico, S.C., Virgin Islands.	N.Y.—All except Alaska, Canal Zone, Hawaii, Puerto Rico, Virgin Islands.
Superior Insurance Company, Dallas, Tex.	521,000	Ariz., Cal., Colo., Ga., Ind., Kans., Mich., N. Mex., Okla., Tex., Utah., Wyo.	TEX.—
Superior Risk Insurance Company, LeRoy, Ohio.	789,000	Ariz., Cal., Colo., Conn., Del., D.C., Ill., Ind., Iowa, Ky., Md., Mass., Mich., Minn., Nev., N.J., N.Y., Ohio, Pa., R.I., Va., W. Va., Wis.	OHIO—All except Ala., Alaska, Canal Zone, Fla., Ga., Hawaii, Kans., La., Me., Miss., Mo., Mont., Nebr., N.H., eN.Y., N. Dak., Puerto Rico, R.I., S.C., S. Dak., Tenn., Tex., Vt., wVa., Virgin Islands, Wyo.
Traders & General Insurance Company, Dallas, Tex.	196,000	Ark., Colo., Kans., La., Miss., Mo., N. Mex., Okla., Tex.	TEX.—D.C.
Transamerica Insurance Company, Los Angeles, Cal.[7]	6,185,000	All except Virgin Islands.	CAL.—All except Canal Zone, sGa., sIll., nInd., sIowa, eKy., Nebr., N.H., N.J., wN.Y., eN.C., nePa., meTenn., Virgin Islands, nW. Va., Wyo.
Transcontinental Insurance Company, Hartford, Conn.	2,905,000	All except Canal Zone, Del., Hawaii, La., Oreg., Virgin Islands.	N.Y.—All except Alaska, Canal Zone, Del., msGa., Hawaii, La., Miss., Oreg., Puerto Rico, S.C., Vt., Virgin Islands.
Transit Casualty Company, St. Louis, Mo.	413,000	Ala., Alaska, Cal., D.C., Ill., Ind., Iowa, Ky., Md., Mich., Miss., Mo., Mont., Nebr., Nev., N.J., N.C., N. Dak., Ohio, Okla., R.I., Utah, Vt., Wash., Wis., Wyo.	MO.—D.C.
Transport Indemnity Company, Los Angeles, Cal.	740,000	All except Canal Zone, Ga., N.Y., Virgin Islands.	CAL.—All except Alaska, Canal Zone, Kans., eKy., eLa., Mass., sMiss., Nev., N.Y., sOhio, eOkla., ePa., Puerto Rico, R.I., S. Dak., mTenn., wVa., Virgin Islands, W. Va.
Transportation Insurance Company, Chicago, Ill.	790,000	All except Alaska, Canal Zone, Hawaii, Puerto Rico, Virgin Islands.	ILL.—All except Alaska, nCal., Canal Zone, Conn., sFla., Hawaii, eKy., Minn., wMo., Nev., N.H., wN.Y., Ohio, ePa., Puerto Rico, S. Dak., Virgin Islands, wWash., nW. Va., Wis.
The Travelers Indemnity Company, Hartford, Conn.	21,000,000	All	CONN.—All.
Trinity Universal Insurance Company, Dallas, Tex.	1,889,000	All except Alaska, Canal Zone, Conn., Del., Hawaii, Idaho, Me., Md., Mass., Mont., Nev., N.H., N.J., N.Y., Puerto Rico, R.I., S.C., Tenn., Utah, Vt., Va., Virgin Islands, W. Va., Wyo.	TEX.—All.
Tri-State Insurance Company, Tulsa, Okla.	283,000	All except Cal., Canal Zone, Conn., Del., D.C., Hawaii, Me., Md., Mass., Mich., N.H., N.J., N.Y., N.C., N. Dak., Ohio, Oreg., Pa., Puerto Rico, R.I., S.C., Vt., Virgin Islands, W.Va., Wis.	OKLA.—All except Cal., Canal Zone, Conn., Del., Hawaii, Me., Md., Mass., Mich., N.H., N.J., N.Y., N.C., Ohio, Oreg., Pa., Puerto Rico, R.I., S.C., Vt., Va., Virgin Islands, W. Va., Wis.
Twin City Fire Insurance Company, Minneapolis, Minn.	688,000	All except Canal Zone, Puerto Rico, Virgin Islands.	MINN.—Conn., D.C., La.
United Bonding Insurance Company, Indianapolis, Ind.	64,000	All except Canal Zone, Conn., N.Y., Puerto Rico, S.C., Virgin Islands, W. Va.	IND.—All except nsAla., Canal Zone, Conn., Del., Hawaii, Me., Mass., Mont., N.Y., N.Dak., Puerto Rico, S.C., meTenn., Virgin Islands.
United Fire & Casualty Company, Cedar Rapids, Iowa.	100,000	Ariz., Colo., Idaho, Ill., Iowa, Minn., Mo., Mont., Nebr., N. Mex., N. Dak., S. Dak., Utah, Wash., Wis., Wyo.	IOWA—D.C., nsIll., Minn., Mo., Nebr., S. Dak., Wis.
United Pacific Insurance Company, Tacoma, Wash.	1,430,000	All except Ala., Canal Zone, Conn, Del., Fla., Ga., Hawaii, La., Me., Md., Mass., N.J., N.C., Pa., Puerto Rico, R.I., S.C., Vt., Va., Virgin Islands, W. Va.	WASH.—All except Canal Zone, Puerto Rico, Virgin Islands.
United States Casualty Company, New York, N.Y.	1,719,000	All except Canal Zone, Hawaii	N.Y.—All except Alaska, Canal Zone, Hawaii, wLa.
United States Fidelity and Guaranty Company, Baltimore, Md.	33,624,000	All	MD.—All.
United States Fire Insurance Company, New York, N.Y.	10,235,000	All except Canal Zone, Virgin Islands.	N.Y.—All except Alaska, Canal Zone, Hawaii, Virgin Islands.
Universal Surety Company, Lincoln, Nebr.	160,000	Ariz., Colo., Iowa, Kans., Minn., Mo., Mont., Nebr., Nev., N. Mex., N. Dak., Ohio, Okla., S. Dak., Tex., Wyo.	NEBR.—Ariz., Colo., D.C., Iowa, Kans., Minn., Mo., Mont., N. Mex., N. Dak., wOkla., S. Dak., nTex., Utah, Wyo.
Utica Mutual Insurance Company, Utica, N.Y.	1,678,000	All except Alaska, Ark., Canal Zone, Hawaii, Kans., La., Me., Mich., Oreg., Puerto Rico, S. Dak., Virgin Islands.	N.Y.—All except Alaska, Canal Zone, Hawaii, Me., Puerto Rico, Virgin Islands.
Valley Forge Insurance Company, Reading, Pa.	1,043,000	All except Alaska, Ariz., Cal., Canal Zone, Conn., D.C., Fla., Hawaii, Idaho, Kans., Ky., La., Me., Nebr., N.H., N. Mex., N.C., Oreg., Puerto Rico, R.I., S.C., S. Dak., Tenn., Virgin Islands, Wyo.	PA.—All except Virgin Islands, Wis.
Vigilant Insurance Company, New York, N.Y.	1,874,000	All except Alaska, Canal Zone, Hawaii, Puerto Rico.	N.Y.—All except Alaska, Hawaii, Puerto Rico, Virgin Islands.
West American Insurance Company, Los Angeles, Cal.	407,000	Ark., Cal., Colo., D.C., Ill., Ind., Iowa, Kans., Ky., La., Md., Mich., Minn., Mo., Nebr., Nev., N. Mex., N. Dak., Ohio, Okla., Oreg., Pa., Utah., Va., Wash., Wis., Wyo.	CAL.—Ala., Colo., D.C., Fla., Ga., Ill., Ind., Iowa, Kans., Ky., eLa., Md., Mich., Minn., Mo., Nev., N. Mex., N. Dak., Ohio, nOkla., Oreg., Pa., mTenn., Tex., Utah, Va., Wash., Wis., Wyo.
Westchester Fire Insurance Company, New York, N.Y.	6,020,000	All except Canal Zone, Hawaii, Puerto Rico, Virgin Islands.	N.Y.—All except Alaska, Canal Zone, Hawaii, Puerto Rico, Virgin Islands.
The Western Casualty and Surety Company, Fort Scott, Kans.	3,028,000	All except Alaska, Canal Zone, Conn., Del., Hawaii, Maine, Mass., N.H., N.Y., N.C., Pa., Puerto Rico, R.I., Vt., Va., Virgin Islands, W.Va.	KANS.—All except Puerto Rico, Virgin Islands.

See **footnotes at end of table.**

Companies Holding Certificates of Authority From Secretary of the Treasury Under Act of Congress, Approved July 30, 1947 (6 U.S.C. 6-13) as Acceptable Sureties on Federal Bonds (a)—Continued

Names of companies and locations of principal executive offices	Underwriting limitations (net limit on any one risk) see footnote (b)	States and other areas in which licensed to transact a fidelity and surety business. See footnote (c)	State in which incorporated and judicial districts in which process agents have been appointed. (State of incorporation in capitals. Letters preceding names of States indicate judicial districts.) See footnote (d)
The Western Fire Insurance Company, Fort Scott, Kans.	$1,426,000	Ariz., Ark., Cal., Colo., Fla., Ill., Ind., Iowa, Kans., Ky., Mich., Minn., Miss., Mo., Nebr., Nev., N. Mex., N.Y., N. Dak., Ohio, Okla., S. Dak., Tenn., Utah, Wash., Wis., Wyo.	KANS.—All except Puerto Rico, Virgin Islands.
Western Surety Company, Sioux Falls, S. Dak.	640,000	All except Ala., Alaska, Canal Zone, Fla., Ga., Hawaii, Me., N.H., N.Y., N.C., Puerto Rico, S.C., Vt., Va., Virgin Islands, W. Va.	S. DAK.—All except Alaska, Canal Zone, Hawaii, Puerto Rico, Virgin Islands.
Wolverine Insurance Company, Battle Creek, Mich.	263,000	Alaska, Ark., Cal., Fla., Ga., Ill., Ind., Iowa, Kans., Mich., Minn., Nebr., Nev., N. Mex., N. Dak., Ohio, Pa., S. Dak., Vt., W. Va., Wyo.	MICH.—D.C., Ga., Ill., Ind., Iowa, Minn., Ohio, S. Dak.
The Yorkshire Insurance Company of New York, New York, N.Y.	711,000	All except Canal Zone, Hawaii, Puerto Rico, S. Dak., Virgin Islands.	N.Y.—All except Alaska, Puerto Rico, Virgin Islands.

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[1] American Independent Reinsurance Company merged with this company effective April 8, 1964.

[2] Inter-Ocean Reinsurance Company merged with this company effective December 31, 1963.

[3] Columbia Casualty Company merged with this company effective December 31, 1963.

[4] This company acquired the business, assets and liabilities of the U.S. Branch of the North British and Mercantile Insurance Company, Ltd., December 31, 1963.

[5] Standard Accident Insurance Company merged with this company effective December 31, 1963.

[6] New England Insurance Company and The Standard Insurance Company merged with this company effective December 31, 1963.

[7] Formerly Pacific National Insurance Company. Name changed effective November 13, 1963. American Surety Company of New York merged into this company effective December 31, 1963.

NOTES

(a) All certificates of authority expire May 31, and are renewable June 1, annually.

(b) Treasury regulations do not limit the penal sum of bonds which surety companies may execute. The net retention, however, cannot exceed the underwriting limitation and excess risks must be protected by reinsurance, co-insurance, or other methods in accordance with Treasury regulations. When excess risks on bonds in favor of the United States are protected by reinsurance, such reinsurance is to be effected by use of Treasury Form 369 to be filed with the bond or within 45 days thereafter. Risks in excess of limit fixed herein must be reported for quarter in which they are executed. In protecting such excess, the rating in force on the date of the execution of the risk will govern absolutely. This limit applies until a new rating is established by the Treasury Department.

(c) The term "other areas" includes Canal Zone, Puerto Rico and Virgin Islands.

(d) Abbreviated capital letters preceding judicial districts indicate State in which the company is incorporated. Process agents are required in the following districts: Where principal resides; where obligation is to be performed; and where bond is returnable or filed. No process agent required in State wherein company is incorporated. Letters "n, s, e, m, and w" preceding names of States indicate respectively the Northern, Southern, Eastern, Middle, and Western judicial districts of States indicated. If letters do not precede names of States, process agents have been appointed in all judicial districts of such States.

Companies Holding Certificates of Authority From the Secretary of the Treasury as Acceptable Reinsuring Companies Under Treasury Circular No. 297, Dated July 5, 1922, as Amended

Names of companies	Underwriting limitations (net limit on any one risk)	Judicial Districts in which process agents have been appointed
Accident and Casualty Insurance Company of Winterthur, Switzerland (U.S. Office, New York, N.Y.)	$1,322,000	D.C.
Alliance Assurance Company, Ltd., London, England (U.S. Office, New York, N.Y.)	610,000	D.C.
Atlas Assurance Company, Limited, London, England (U.S. Office, New York, N.Y.)	868,000	D.C.
Constellation Insurance Company, New York, N.Y	304,000	D.C.
The Employers' Liability Assurance Corporation, Ltd., London, England (U.S. Office, Boston, Mass.)	6,094,000	D.C.
General Accident Fire and Life Assurance Corporation, Limited, Perth, Scotland (U.S. Office, Philadelphia, Pa.)	9,621,000	D.C.
General Security Assurance Corporation of New York, New York, N.Y	397,000	D.C.
The Guarantee Company of North America, Montreal, Canada (U.S. Office, New York, N.Y.)	112,000	D.C.
The London Assurance, London, England (U.S. Office, New York, N.Y.)	681,000	D.C.
London Guarantee and Accident Company, Ltd., London, England (U.S. Office, New York, N.Y.)	1,160,000	D.C.
The London & Lancashire Insurance Company, Ltd., London, England (U.S. Office, Hartford, Conn.)	887,000	D.C.
The Marine Insurance Company, Ltd., London, England (U.S. Office, New York, N.Y.)	746,000	D.C.
Metropolitan Fire Assurance Company, Hartford, Conn.	245,000	
Munich Reinsurance Company, Munich, Germany (U.S. Office, New York, N.Y.)	962,000	D.C.
The Netherlands Insurance Company, Est. 1845, The Hague, Holland (U.S. Office, Keene, N.H.)	519,000	D.C.
The Royal Exchange Assurance, London, England (U.S. Office, New York, N.Y.)	554,000	D.C.
Royal Insurance Company, Ltd., Liverpool, England (U.S. Office, New York, N.Y.)	3,385,000	D.C.
The Sea Insurance Company, Limited, of Liverpool, England (U.S. Office, New York, N.Y.)	593,000	D.C.
The Skandia Insurance Company, Stockholm, Sweden (U.S. Office, New York, N.Y.)	978,000	D.C.
Sun Insurance Office, Limited, London, England (U.S. Office, New York, N.Y.)	1,017,000	D.C.
Swiss Reinsurance Company, Zurich, Switzerland (U.S. Office, New York, N.Y.)	3,232,000	D.C.
Transatlantic Reinsurance Company, New York, N.Y	167,000	D.C.
The Unity Fire and General Insurance Company, New York, N.Y	477,000	D.C.
Zurich Insurance Company, Zurich, Switzerland (U.S. Office, Chicago, Ill.)	6,917,000	D.C.

[F.R. Doc. 64-5370; Filed, June 1, 1964; 8:45 a.m.]

DEPARTMENT OF COMMERCE

Bureau of International Commerce

[File 23–942]

SCHIFTER & CO. ET AL.

Supplement to Order Denying Export Privileges for Indefinite Period

In the matter of Schifter & Company, Herbert E. Schifter, Alice Helm, Dr. Franz Helm, 3/4 Georg Coch-Platz, Vienna I, Austria, File 23–942; respondents.

By order dated May 11, 1964 (29 F.R. 6697, May 22, 1964) the above respondents, in accordance with § 382.15 of the Export Regulations (Title 15, Ch. III, Subchapter B, Code of Federal Regulations), were denied export privileges for an indefinite period because said respondents failed to answer interrogatories and furnish certain records and other writings specifically requested without good cause being shown.

The respondents alleged that they had good cause for failing to answer the interrogatories and furnish the information requested. The order of May 11, 1964, above referred to, rejected the grounds alleged by respondents as good cause for failing to answer, but the reasons for such rejection were not given. It is now considered desirable to set forth in particular the grounds which were alleged by respondents and the reasons why they were not accepted.

The respondents claim that they are prohibited from giving the information requested because of a contractual obligation with a third party, which contract was determined by an Austrian court to be binding and enforceable.

The contract was between the respondent Schifter, as manager of Schifter & Company, and the person to whom the firm sold the commodities in question. Under this contract it was irrevocably agreed that neither party would give information to third parties, or to any local or foreign government, concerning arrival or use of the commodities. The vendee brought legal action in an Austrian court to enforce this contract and the court ruled that Schifter is obligated under the contract to maintain secrecy regarding delivery and use of the commodities and that the contract was binding. The court restrained Schifter from giving to third persons information concerning type, quantity, and use of commodities to be delivered to the vendee under the contract. The question before us is whether this contract and the ruling of the court constitutes good cause for respondents failure to furnish the information requested in the interrogatories. We hold that it does not.

In the Export Control Act, the Congress of the United States has declared that it is the policy of this country to use export controls to the extent necessary to further the foreign policy of the United States and to aid in fulfilling its international obligations, and to exercise the necessary vigilance over exports from the standpoint of their significance to the national security of the United States. To the extent necessary or appropriate to the enforcement of the Act, Congress has authorized the Department of Commerce to make investigations, obtain information and records, and to take sworn testimony of any person.

Where a party resides in the United States he may be required by subpoena to given evidence and furnish records. A resident of a foreign country is not amenable to a United States subpoena. Where information is sought from a foreign resident regarding his handling of, or other connection with, U.S. goods, information with respect thereto is solicited by written interrogatories. The party interrogated is informed (and Schifter was so informed in this instance) that under the law information given in interrogatories will not be divulged except for law enforcement purposes. Refusal of a party to give responsive answers to interrogatories can destroy one of the most effective methods of determining whether an important purpose of the Export Control Act is being accomplished, i.e., preventing U.S. origin commodities from reaching unauthorized persons or destinations.

In permitting the exportation of commodities from the United States this government has authority to impose restrictions as to their destination and it does so. Parties who handle U.S. commodities are informed of the destination restrictions on invoices, and on shipping and other export documents. Our regulations require that such parties adhere to the restrictions. The regulations also require that such parties, when requested, give information as to their handling of such commodities. We feel that these are reasonable requirements for an individual to meet in order to maintain the privilege of dealing in U.S. goods.

A party may choose, because of personal reasons or because of a private undertaking, to refuse to answer interrogatories. We do not question his right to make this choice. However, in so doing he must accept the consequences of his refusal to answer. The consequences in this case are denial of privileges of dealing in exportations from the United States.

If we were to accept as good cause for failure to answer interrogatories a private undertaking between the parties not to disclose information, the investigation program abroad as to the disposition of U.S. goods could be undermined. Parties could enter into such agreements for the sole purpose of frustrating such investigations. Indeed, this may have been the purpose of the parties to the contract in question.

We wish to make it clear that we do not here question the authority of the Austrian court to determine under the laws of that country the rights of parties within its jurisdiction under a contract made in that country. However, the contract was voluntarily entered into between the parties and neither the contract nor the ruling of the court constitutes good cause under the regulations of the Export Control Act for failure to answer the interrogatories.

The order of May 11, 1964 is affirmed in all respects.

Dated: May 25, 1964.

Rauer H. Meyer,
Acting Director,
Office of Export Control.

[F.R. Doc. 64–5428; Filed, June 1, 1964; 8:47 a.m.]

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Food and Drug Administration

GENERAL MILLS, INC.

Notice of Issuance of Temporary Permit for Market Testing of Enriched Self-Rising Flour Deviating From Identity Standard

Pursuant to § 10.5(j) of Title 21, Code of Federal Regulations, concerning temporary permits for market testing of foods varying from the requirements of standards of identity, as promulgated by authority of section 401 of the Federal Food, Drug, and Cosmetic Act, notice is given that a temporary permit has been issued to General Mills, Inc., 9200 Wayzata Boulevard, Minneapolis, Minnesota. This permit covers interstate market tests of enriched self-rising flour deviating from the requirements of the standard (21 CFR 15.60). The food is to be modified so that the particles will be too coarse to comply with the granulation specification of the standard, and a trace of vegetable oil will be added to insure uniformity. The label will designate the food as "Instantized Enriched Self-Rising Flour with Vegetable Oil Added To Insure Uniformity." This permit expires May 31, 1965.

Dated: May 26, 1964.

John L. Harvey,
Deputy Commissioner
of Food and Drugs.

[F.R. Doc. 64–5426; Filed, June 1, 1964; 8:47 a.m.]

ATOMIC ENERGY COMMISSION

[Docket No. 50–57]

WESTERN NEW YORK NUCLEAR RESEARCH CENTER, INC.

Notice of Issuance of Construction Permit

Please take notice that no request for a formal hearing having been filed following publication of the notice of proposed action in the Federal Register on May 5, 1964, 29 F.R. 5914, the Atomic Energy Commission has issued Construction Permit No. CPRR–79. The construction permit authorizes Western New York Nuclear Research Center, Inc. to (1) construct a low enriched, uranium dioxide, rod-type core to replace the presently licensed uranium-aluminum plate-type core in its nuclear reactor, (2) install an 8-inch gate valve in the primary system, (3) construct an exposure chamber, and (4) install two fans in the stack ventilation system.

The permit as issued is in the form published in the notice of proposed action.

Dated at Bethesda, Md., this 21st day of May 1964.

For the Atomic Energy Commission.

Roger S. Boyd,
Chief, Research and Power Reactor Safety Branch, Division of Reactor Licensing.

[F.R. Doc. 64-5419; Filed, June 1, 1964; 8:46 a.m.]

CIVIL AERONAUTICS BOARD

[Docket 15063]

AEROVIAS QUISQUEYANA, C. POR A.

Notice of Hearing

Notice hereby is given, pursuant to the provisions of the Federal Aviation Act of 1958, as amended, that hearing in the above-entitled proceeding is assigned to be held on June 9, 1964, at 10 a.m., e.d.t., in Room 911, Universal Building, Connecticut and Florida Avenues NW., Washington, D.C.

Dated at Washington, D.C., May 27, 1964.

[SEAL] Herbert K. Bryan,
Hearing Examiner.

[F.R. Doc. 64-5429; Filed, June 1, 1964; 8:47 a.m.]

[Docket 15271]

WATERLOO-WELLINGTON FLYING CLUB INC.

Notice of Hearing

Application of Waterloo-Wellington Flying Club Inc., for a foreign air carrier permit, issued pursuant to section 402 of the Federal Aviation Act of 1958, as amended, to perform operations of a casual, occasional or infrequent nature, in common carriage, into the United States.

Notice is hereby given that a hearing on the above-entitled application is assigned to be held on June 3, 1964, at 10 a.m., e.d.s.t., in Room 701, Universal Building, Connecticut and Florida Avenues NW., Washington, D.C., before Examiner Joseph L. Fitzmaurice.

Dated at Washington, D.C., May 26, 1964.

[SEAL] Francis W. Brown,
Chief Examiner.

[F.R. Doc. 64-5430; Filed, June 1, 1964; 8:47 a.m.]

FEDERAL COMMUNICATIONS COMMISSION

[Docket Nos. 15431, 15432; FCC 64M-460]

ORANGE COUNTY RADIOTELEPHONE SERVICE, INC., AND ITT MOBILE TELEPHONE, INC.

Order Continuing Hearing

In re applications of Orange County Radiotelephone Service, Inc., Docket No. 15431, File No. 4273-C2-P-63, for a construction permit to modify the facilities of station KMB304 in the Domestic Public Land Mobile Radio Service, near Los Angeles, California; ITT Mobile Telephone, Inc., Docket No. 15432, File No. 4342-C2-P-61, for a construction permit to modify the facilities of station KMA-200 in the Domestic Public Land Mobile Radio Service, near Los Angeles, California.

A prehearing conference in the above-entitled proceeding having been held as scheduled on May 25, 1964,

It is ordered, This 25th day of May 1964, that the procedural ground rules established at said conference are hereby approved and that the transcript of said conference, incorporated herein by reference with the same force and effect as if set forth at length, shall control as to any question bearing on the established ground rules; and

It is further ordered, That the hearing, presently scheduled to commence on July 6, 1964, is continued to 10 a.m., July 27, 1964.

Released: May 26, 1964.

Federal Communications Commission,
[SEAL] Ben F. Waple,
Secretary.

[F.R. Doc. 64-5432; Filed, June 1, 1964; 8:48 a.m.]

[Docket Nos. 15482, 15483; FCC 64-450]

SOUTH JERSEY TELEVISION CABLE CO.

Memorandum Opinion and Order Designating Applications for Consolidated Hearing on Stated Issues

In re application of: South Jersey Television Cable Co., Docket No. 15482, File No. 17325-IB-114X, for operational fixed stations in the Business Radio Service; South Jersey Television Cable Co., Docket No. 15483, File No. 17326-IB-114X, for operational fixed stations in the Business Radio Service.

1. The Commission has before it for consideration: (a) A "Petition to Deny" filed April 13, 1964, by Francis J. Matrangola (petitioner), permittee of Station WCMC-TV, Channel 40, Wildwood, New Jersey, directed against a grant of the above-captioned applications; and (b) a "Statement of South Jersey Television Cable Co." filed April 28, 1964, by South Jersey Television Cable Co. (applicant).

2. On November 13, 1963, the applicant filed the above-captioned applications for construction permits for new microwave facilities to be used to supply eight channels of television service to CATV systems in the city of Wildwood, city of North Wildwood and the borough of Wildwood Crest, Cape May County, New Jersey. On February 3, 1964, the applicant amended its applications and stated, in pertinent part, that,

> This is to advise the Commission that, in order to secure a grant of its pending applications, South Jersey Television Cable Co. hereby accepts the interim conditions contained in the new proposed rules. Specifically, the applicant accepts the conditions proposed in § 11.556(a) and it also agrees to afford similar protection to television stations, within whose predicted Grade B contour the applicants' CATV systems operate or will operate, which request such protection * * *.

3. Petitioner is the permittee of Station WCMC-TV, Channel 40, Wildwood, New Jersey. It is clear that this station would compete for audience with community antenna systems operating in the city of Wildwood, city of North Wildwood and the borough of Wildwood Crest, Cape May County, New Jersey. Therefore, it is clear that petitioner has standing as a "party in interest" within the meaning of section 309(d) of the Communications Act of 1934, as amended. Federal Communications Commission v. Sanders Brothers Radio Station, 309 U.S. 470.

4. Petitioner urges that if applicant is permitted to bring eight or more television signals into its predicted service area by means of microwave it will be exposed to such severe competition that it would "amount to a revocation of the WCMC-TV construction permit". Petitioner urges that this is particularly the case since Station WCMC-TV is to be UHF, and in support cites the difficulties UHF stations have encountered in general. On the basis of these allegations, and relying on the Commission's recent decision in Lompoc Valley Cable TV, FCC 64-170, 2 R.R. 2d 22, petitioner argues that the above-captioned applications must be designated for hearing. In response, the applicant has stated, in relevant part, that,

> The grant of its applications would not be contrary to the public interest. However, under current Commission policy, cf. Lompoc Valley Cable TV, FCC 64-170, released March 11, 1964, it seems apparent that the Commission will not resolve the matter on the basis of pleadings and that the Commission will consider it necessary to conduct a hearing to develop a full and complete factual basis for decision.

It seems obvious that the applicant's willingness to accept the Docket No. 14895 conditions cannot be an adequate answer if, in fact, its proposed operation would endanger Station WCMC-TV. The pleadings presently before the Commission do not supply the information which could be considered in attempting to assess the effect of the grant. Consequently, the Commission believes it necessary to designate the present application for hearing in order to gather on a record the full background of information—including such matters as the populations affected and the other television service, both from operating broadcast stations and from existing or proposed community antenna systems—to estimate the potential impact of the applicant's proposal. See Lompoc Valley Cable TV, supra.

5. In view of the foregoing, the Commission is unable to make the statutory finding that a grant of these applications would serve the public interest, convenience, and necessity, and is of the opinion that the applications must be designated for hearing on the issues set forth below.

Accordingly, it is ordered, That, pursuant to section 309(e) of the Communications Act of 1934, as amended, the above-captioned applications of South Jersey Television Cable Co. are designated for hearing at a time and place to be specified in a subsequent Order upon the following issues:

1. To determine the areas and populations which would receive a predicted signal from Station WCMC-TV and to determine what other television service—either from broadcast stations or from community antenna systems—is presently available, or will be, to the public in this area.

2. To determine what impact a grant of the above-captioned applications will have upon the operation of Station WCMC-TV, Wildwood, New Jersey, and the resulting injury, if any, to the public to be served thereby.

3. To determine in view of the evidence adduced pursuant to the foregoing issues whether and, if so, under what conditions a grant of the above-captioned applications would serve the public interest, convenience and necessity.

It is further ordered, That the "Petition to Deny" filed by petitioner on April 13, 1964, is granted to the extent indicated above and is otherwise denied.

It is further ordered, That Francis J. Matrangola and Chief, Broadcast Bureau are made parties to this proceeding.

It is further ordered, That the burden of proceeding with the introduction of evidence and the burden of proof with respect to Issues 1 and 2 is hereby placed on Francis J. Matrangola.

It is further ordered, That to avail themselves of the opportunity to be heard, the applicant and the party respondent herein, pursuant to § 1.221 of the Commission's rules, in person or by attorney, shall within twenty (20) days of the mailing of this Order file with the Commission, in triplicate, a written appearance stating an intention to appear on the date fixed for the hearing and present evidence on the issues specified in this Order.

Adopted: May 20, 1964.

Released: May 27, 1964.

FEDERAL COMMUNICATIONS
COMMISSION,[1]
[SEAL] BEN F. WAPLE,
Secretary.

[F.R. Doc. 64-5433; Filed, June 1, 1964; 8:48 a.m.]

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[1] Commissioners Bartley and Loevinger dissenting; Commissioner Lee absent; Commissioner Ford not participating.

FEDERAL MARITIME COMMISSION

CHINA NAVIGATION CO., LTD., AND NEDLLOYD & HOEGH LINES

Notice of Filing of Agreement

Notice is hereby given that the following described agreement has been filed with the Commission for approval pursuant to section 15 of the Shipping Act, 1916 (39 Stat. 733; 75 Stat. 763; 46 U.S.C. 814);

Agreement 9241, refiled, between The China Navigation Co., Ltd., and Nedlloyd & Hoegh Lines, an approved Joint Service operating under Agreement 7636, as amended, provides for a through billing arrangement for the movement of asbestos in bags in the trade from Western Australia to West Coast ports of the United States including Hawaii with transhipment at Singapore in accordance with terms and conditions set forth in the agreement.

Interested parties may inspect this agreement and obtain copies thereof at the Bureau of Foreign Regulations, Federal Maritime Commission, Washington, D.C., 20573, or may inspect a copy at the offices of the District Managers of the Commission in New York, N.Y., New Orleans, La., and San Francisco, Calif., and may submit to the Secretary, Federal Maritime Commission, Washington, D.C., 20573, within 5 days after publication of this notice in the FEDERAL REGISTER, written statements with reference to the agreement and their position as to approval, disapproval, or modification, together with a request for hearing, should such hearing be desired.

Dated: May 26, 1964.

By order of the Federal Maritime Commission.

THOMAS LISI,
Secretary.

[F.R. Doc. 64-5406; Filed, June 1, 1964; 8:45 a.m.]

FEDERAL NEW ZEALAND LINES ET AL.

Notice of Filing of Agreement

Notice is hereby given that the following described agreement has been filed with the Commission for approval pursuant to section 15 of the Shipping Act, 1916 (39 Stat. 733; 75 Stat. 763; 46 U.S.C. 814):

Agreement 8535-2 between Federal New Zealand Lines, Shaw Savill & Albion Co., Ltd., Port and Associated Lines and Blue Star Line Ltd., modifies approved Agreement No. 8535 by showing discharging ports as "East Coast and Gulf Ports of the United States of America, Puerto Rico and the Virgin Islands." The basic agreement shows the discharging ports as "ports on the East Coast of the United States of America and ports in the Gulf of Mexico and the Panama Canal Zone."

Interested parties may inspect this agreement and obtain copies thereof at the Bureau of Foreign Regulation, Federal Maritime Commission, Washington, D.C., or may inspect a copy at the offices of the District Managers of the Commission in New York, N.Y., New Orleans, La., and San Francisco, Calif., and may submit to the Secretary, Federal Maritime Commission, Washington, D.C., 20573, within 20 days after publication of this notice in the FEDERAL REGISTER, written statements with reference to the agreement and their position as to approval, disapproval, or modification, together with a request for hearing, should such hearing be desired.

Dated: May 27, 1964.

By order of the Federal Maritime Commission.

THOMAS LISI,
Secretary.

[F.R. Doc. 64-5407; Filed, June 1, 1964; 8:45 a.m.]

MEMBER LINES OF GULF/SOUTH AND EAST AFRICAN CONFERENCE

Notice of Filing of Agreement

Notice is hereby given that the following described agreement has been filed with the Commission for approval pursuant to section 15 of the Shipping Act, 1916 (39 Stat. 733; 75 Stat. 763; 46 U.S.C. 814):

Agreement 7780-6 between the member lines of the Gulf/South and East African Conference amends the basic agreement to include the Seychelles Islands within the trade area.

Interested parties may inspect this agreement and obtain copies thereof at the Bureau of Foreign Regulation, Federal Maritime Commission, Washington, D.C., or may inspect a copy at the offices of the District Managers of the Commission in New York, N.Y., New Oreans, La., and San Francisco, Calif., and may submit to the Secretary, Federal Maritime Commission, Washington, D.C., 20573, within 20 days after publication of this notice in the FEDERAL REGISTER, written statements with reference to the agreement and their position as to approval, disapproval, or modification, together with a request for hearing, should such hearing be desired.

Dated: May 27, 1964.

By order of the Federal Maritime Commission.

THOMAS LISI,
Secretary.

[F.R. Doc. 64-5408; Filed, June 1, 1964; 8:45 a.m.]

YAMASHITA SHINNIHON STEAMSHIP CO., LTD., AND UNION OF BURMA FIVE STAR LINE CORP.

Notice of Filing of Agreement

Notice is hereby given that the following described agreement has been filed with the Commission for approval pursuant to section 15 of the Shipping Act, 1916 (39 Stat. 733; 75 Stat. 763; 46 U.S.C. 814):

Agreement 9351 between Yamashita-Shinnihon Steamship Co., Ltd., and The Union of Burma Five Star Line Corporation establishes a through billing arrangement for the movement of cargo from United States ports to ports in Burma with transshipment at Yokohama, Kobe, or Osaka, Japan, under terms and conditions set forth in said agreement.

Interested parties may inspect this agreement and obtain copies thereof at the Bureau of Foreign Regulation, Federal Maritime Commission, Washington, D.C., 20573, or may inspect a copy at the offices of the District Managers of the Commission in New York, N.Y., New Orleans, La., and San Francisco, Calif., and may submit to the Secretary, Federal Maritime Commission, Washington, D.C., 20573, within 20 days after publication of this notice in the FEDERAL REGISTER, written statements with reference to the agreement and their position as to approval, disapproval, or modification, together with a request for hearing, should such hearing be desired.

Dated: May 27, 1964.

By order of the Federal Maritime Commission.

THOMAS LISI,
Secretary.

[F.R. Doc. 64-5409; Filed, June 1, 1964; 8:45 a.m.]

BOARD OF COMMISSIONERS OF PORT OF NEW ORLEANS AND PUBLIC GRAIN ELEVATOR OF NEW ORLEANS, INC.

Notice of Agreement Filed for Approval

Notice is hereby given that the following described agreement has been filed with the Commission for approval pursuant to section 15 of the Shipping Act, 1916 (39 Stat. 733, 75 Stat. 763; 46 U.S.C. 814):

Agreement No. T-590, between the Board of Commissioners of the Port of New Orleans (Board), and Public Grain Elevator of New Orleans, Inc. (Elevator), provides for the lease of a grain elevator at New Orleans to be operated as a public export grain elevator. Elevator agrees to publish a tariff of charges which will be competitive with elevators at New Orleans and other competitive Gulf Ports, subject to the approval of the Board.

Interested parties may inspect the agreement and obtain copies thereof at the Bureau of Domestic Regulation, Federal Maritime Commission, Washington, D.C., 20573, or may inspect a copy at the offices of the District Managers of the Commission in New York, N.Y., New Orleans, La., and San Francisco, Calif., and may submit to the Secretary, Federal Maritime Commission, Washington, D.C., 20573, within 20 days after publication of this notice in the FEDERAL REGISTER, written statements with reference to the agreement and their position as to approval, disapproval, or modification, together with a request for hearing, should a hearing be desired.

Dated: May 27, 1964.

By order of the Federal Maritime Commission.

THOMAS LISI,
Secretary.

[F.R. Doc. 64-5434; Filed, June 1, 1964; 8:48 a.m.]

SECURITIES AND EXCHANGE COMMISSION

[File Nos. 7-2375, 7-2376]

AVON PRODUCTS, INC., AND CONTINENTAL AIR LINES, INC.

Notice of Applications for Unlisted Trading Privileges and of Opportunity for Hearing

MAY 26, 1964.

In the matter of applications of the Philadelphia-Baltimore-Washington Stock Exchange for unlisted trading privileges in certain securities.

The above-named national securities exchange has filed applications with the Securities and Exchange Commission pursuant to section 12(f)(2) of the Securities Exchange Act of 1934 and Rule 12f-1 thereunder, for unlisted trading privileges in the common stocks of the following companies, which securities are listed and registered on one or more other national securities exchanges:

Avon Products, Inc.	File 7-2375
Continental Air Lines, Inc.	File 7-2376

Upon receipt of a request, on or before June 11, 1964, from any interested person, the Commission will determine whether the application with respect to any of the companies named shall be set down for hearing. Any such request should state briefly the title of the security in which he is interested, the nature of the interest of the person making the request, and the position he proposes to take at the hearing, if ordered. In addition, any interested person may submit his views or any additional facts bearing on any of the said applications by means of a letter addressed to the Secretary, Securities and Exchange Commission, Washington 25, D.C., not later than the date specified. If no one requests a hearing with respect to any particular application, such application will be determined by order of the Commission on the basis of the facts stated therein and other information contained in the official files of the Commission pertaining thereto.

For the Commission (pursuant to delegated authority).

[SEAL] ORVAL L. DUBOIS,
Secretary.

[F.R. Doc. 64-5420; Filed, June 1, 1964; 8:46 a.m.]

INTERSTATE COMMERCE COMMISSION

[Notice 991]

MOTOR CARRIER TRANSFER PROCEEDINGS

MAY 27, 1964.

Synopses of orders entered pursuant to section 212(b) of the Interstate Commerce Act, and rules and regulations prescribed thereunder (49 CFR Part 179), appear below:

As provided in the Commission's special rules of practice any interested person may file a petition seeking reconsideration of the following numbered proceedings within 20 days from the date of publication of this notice. Pursuant to section 17(8) of the Interstate Commerce Act, the filing of such a petition will postpone the effective date of the order in that proceeding pending its disposition. The matters relied upon by petitioners must be specified in their petitions with particularity.

No. MC-FC 66620. By order of May 19, 1964, the Transfer Board approved the transfer to Mairs Charter Buses Ltd., Burnaby 3, British Columbia, Canada, of the operating rights of Mairs Transport Ltd., Burnaby 3, British Columbia, Canada, in Certificates in Nos. MC 94109, MC 94109 (Sub-No. 2), and MC 94109 (Sub-No. 3), issued August 13, 1956, June 30, 1961, and December 8, 1961, respectively, authorizing the transportation of passengers and their baggage, in charter operations, over irregular routes, from the international boundary of the United States and Canada through ports of entry in Washington, to points in Whatcom County, Wash., and return; between points of entry on the United States-Canada boundary line located in Washington, on the one hand, and, on the other, Portland, Oreg., and points in Washington; and beginning and ending at ports of entry on the United States-Canada boundary line in Washington, and extending to points in California, Idaho, Nevada, and Oregon (except Portland, Oreg.), as specifically restricted in each certificate: J. Stewart Black, 1322 Laburnum Street, Vancouver 9, British Columbia, attorney for applicants.

No. MC-FC 66789. By order of May 20, 1964, the Transfer Board approved the transfer to D & R Bulk Carriers, Inc., Auburn, Nebr., of Certificates in Nos. MC 107010, MC 107010 (Sub-No. 6), MC 107010 (Sub-No. 8), and MC 107010 (Sub-No. 10), issued November 7, 1958, July 30, 1962, May 15, 1962, and October 30, 1963, respectively, in the name of Ralph E. Darling, doing business as Darling Transport Service, except the (Sub-No. 10) issued after the death of transferor, to Ralph E. Darling, National Bank of Commerce Trust & Savings Association, coexecutor, and Violet M. Darling, executrix, doing business as Darling Transport Service, Auburn, Nebr., authorizing the transportation, over irregular routes, of petroleum products, in bulk, in tank trucks, from refining and distributing points in Kansas to specified points and areas in Nebraska; from Council Bluffs, Iowa, and points within 10 miles of Council Bluffs to points in that part of Nebraska described above, except Omaha; from points in Richardson County, Nebr., to specified area of Iowa; from Falls City, Nebr., to 10 specified points in Kansas; rejects on return; petroleum products, in bulk, from Enid, Okla., to 8 points in Nebraska and Bellville, Kans.; from refining and distributing points in Kansas to Holstein, Hastings, Falls City, Swanton, Nebr.; petroleum products, in bulk, in tank vehicles, from Council Bluffs, Iowa, and points within 10 miles of Council Bluffs to Beatrice, Blue Springs, and Fairbury, Nebr.; refined petroleum products, from refining and distributing points in Kansas to 27 points in Nebraska; refined petroleum products, in bulk, in tank vehicles, from Council Bluffs, Iowa, and points in Iowa within 10 miles of Council Bluffs to 27 points in Nebraska; liquefied petroleum gas, in bulk, in tank vehicles, from the site of the terminal outlet of the Mid-America Pipeline Company pipeline at or near Greenwood, Nebr., to points in Iowa and Kansas; and from the site of the pipeline terminal of Northern Gas Products Company at or near Plattsmouth, Nebr., to points in that part of Iowa on and west of U.S. Highway 169, points in that part of Missouri on and west of a line beginning at the Iowa-Missouri State line and extending along U.S. Highway 169 to St. Joseph, Mo., and points in 12 counties in Kansas. R. E. Powell, 621 Terminal Building, Lincoln, Nebr., 68508, attorney for applicants.

No. MC–FC 66837. By order of May 20, 1964, the Transfer Board approved the transfer to Jones Trucking Co., Inc., Green Bay, Wis., of the operating rights issued by the Commission, September 8, 1950, and September 8, 1950, under Certificate No. MC 52419 and Permit No. MC 84273, respectively, to Jones Transfer & Warehousing Co., a corporation, Green Bay, Wis., authorizing the transportation, under the certificate, of general commodities, over irregular routes, between Green Bay, Howard, Hobart, Ashwaubenon, Allouez, and Preble, Wis., and under the permit, cheese, cheeseboxes, salad dressing, cheese spread, sandwich spread, cheese factory machinery and parts, salt, and tinfoil, from Green Bay, Wis., and points within 6 miles of Green Bay, and Appleton, Wis., to St. Louis, Mo., points in Illinois north of U.S. Highway 50, and specified territory in Indiana; cheese, cheeseboxes, cheese spread, salad oil and dressing, sandwich spread, cheese factory machinery and parts, salt, tinfoil, nails, glass jars and bottles, wire, paper cartons, paper, empty cans, milk powder, cooking oils, bottle caps and covers, paraffin, and canned goods and articles used in the manufacture of cheese factory products, from the above-specified destination points to Green Bay, Wis., and points within 6 miles of Green Bay, and Appleton, Wis.; cheese, cheese spread, salad dressing, and sandwich spread, between Green Bay, Wis., and points within 6 miles of Green Bay, on the one hand, and, on the other, Appleton, Fond du Lac, and Plymouth, Wis., and points within 6 miles of Appleton, Fond du Lac and Plymouth. Edward Solie, 4513 Vernon Boulevard, Madison 5, Wis., attorney for applicants.

No. MC–FC 66862. By order of May 19, 1964, the Transfer Board approved the transfer to Sav-Mor Transportation, Inc., Melrose, Mass., of the operating rights in Certificate of Registration No. 120758 (Sub-No. 1), issued January 21, 1964, to Richard L. Wilkins, doing business as Wilkins Transportation, Lexington, Mass., corresponding to the grant of intrastate authority to transferor, pursuant to Common Carrier Certificate No. 5256, issued November 23, 1960, by the Department of Public Utilities of the Commonwealth of Massachusetts. Joseph A. Kline, 185 Devonshire Street, Boston, Mass., attorney for applicants.

No. MC–FC 66904. By order of May 19, 1964, the Transfer Board approved the transfer to Jennings Bond, doing business as Bond Enterprises, Lutesville, Mo., of the operating rights in Certificates in Nos. MC 117473 (Sub-No. 3), MC 117473 (Sub-No. 4), and MC 117473 (Sub-No. 7), issued by the Commission September 22, 1959, March 17, 1960, and June 6, 1960, to C. E. Arndt, Higginsville, Mo., authorizing the transportation, over irregular routes, of: Fertilizer and fertilizer compounds, and material used in their manufacture, between points in Missouri, Kansas, and Illinois. Herman W. Huber, 101 East High Street, Jefferson City, Mo., attorney for applicants.

No. MC–FC 66909. By order of May 20, 1964, the Transfer Board approved the transfer to William Ragen and Catherine Ragen, a partnership, doing business as Ragen Transportation Company, Gloucester City, N.J., of the operating rights in Certificate in No. MC 44373, issued September 12, 1950, to Martin Ragen, Catherine Ragen, and William Ragen, doing business as Ragen Transportation Company, Gloucester City, N.J., authorizing the transportation, over regular and irregular routes, of: Cork, cork products, rugs, carpets, olives, mushrooms, and poultry, textile machinery, and general commodities, with the usual exceptions, between specified points in New York, New Jersey, and Pennsylvania. Isadore H. Schwartz, Juniper & Filbert Streets, 200 Penn Square Building, Philadelphia, Pa., 19107, attorney for applicants.

No. MC–FC 66675. By order of May 21, 1964, the Transfer Board approved the transfer to Dobson Cartage and Storage Company, Bay City, Mich., of the certificate in No. MC 69322, issued April 16, 1941, to J. G. Dobson, doing business as Dobson Cartage and Storage Company, Bay City, Mich., authorizing the transportation of: Household goods, between Bay City, Mich., and points in Michigan as specified on the one hand, and, on the other, points in Illinois, Indiana, New York, Ohio, Pennsylvania, Wisconsin, and ports of entry on the boundary of the United States and Canada between Detroit and Port Huron, Michigan, inclusive. Robert A. Sullivan, 1800 Buhl Building, Detroit, Mich., 48226, attorney for applicants.

[SEAL] HAROLD D. MCCOY,
Secretary.

[F.R. Doc. 64-5425; Filed, June 1, 1964; 8:47 a.m.]

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PART II

FEDERAL REGISTER

THE NATIONAL ARCHIVES OF THE UNITED STATES 1934

VOLUME 29 NUMBER 107

Washington, Tuesday, June 2, 1964

Federal Aviation Agency

[14 CFR Part 25 [New]]

Proposed Airworthiness Standards: Transport Category Airplanes

FEDERAL AVIATION AGENCY

[14 CFR Parts 4b, 25 [New], and SR 422B]

[Regulatory Docket No. 5066; Notice 64-28]

AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES

Notice of Proposed Rule Making

The Federal Aviation Agency is considering recodifying present Part 4b of the Civil Air Regulations into Part 25 [New].

Interested persons are invited to participate in the proposed recodification by submitting such written data, views, or arguments as they may desire. Communications should identify the regulatory docket or notice number and be submitted in duplicate to the Federal Aviation Agency, Office of the General Counsel: Attention Rules Docket, 800 Independence Avenue SW., Washington, D.C., 20553. All communications received within 60 days after publication of this notice in the FEDERAL REGISTER will be considered by the Administrator before taking action on the proposed recodification. The proposal contained in this notice may be changed in the light of comments received. All comments submitted will be available, both before and after the closing date for comments, in the Rules Docket for examination by interested persons.

The object of Part 25 [New] is to restate existing regulations, not to make new ones. The pertinent provisions have been freely reworded and re-arranged, subject to every precaution against disturbing existing rights, privileges, duties, or functions. In addition, in cases where well established administrative practice or construction has established authoritative interpretations, the revised language reflects the interpretations.

Each proposed recodified section is followed by a note citing the present section of the regulations upon which it is based. A cross-reference table has been placed at the end of Part 25 [New] to permit easy access from the old regulations to the new. Internal cross references to parts or sections that are not yet recodified contain a blank space for later insertion of the correct recodified number with the present number contained in brackets. When a part or section that is referred to in a cross reference is later recodified, the correct number will be inserted and the bracketed number will be dropped.

No substantive changes involving an increased burden on the public have been made in the regulations, the purpose of the recodification project being simply to streamline and clarify present regulatory language and to delete obsolete or redundant provisions. It should be noted that the definitions, abbreviations, and rules of construction contained in Part 1 [New] published in the FEDERAL REGISTER on May 15, 1962 (27 F.R. 4587), would apply to the proposed rules. In addition, those definitions in present Part 4b (and not now in Part 1 [New] or executed in proposed Part 25 [New] that are necessary, will be recodified with the definitions of the other airworthiness parts and added to Part 1 [New] prior to the adoption of Part 25 [New].

Proposed Part 21 [New] will contain the procedural requirements for type certification. These requirements, though basically identical, are now repeated in 10 separate airworthiness parts. Proposed Part 25 [New] contains the airworthiness requirements for airplanes to be certificated in transport category.

Proposed Part 25 [New] incorporates the provisions of SR 422B that affect CAR 4b. This eliminates the apparent conflict presently existing when a section of the part concerns both turbine engine and reciprocating engine powered airplanes but one of its conditions refers to a section concerning reciprocating engine powered airplanes only. An example of this may be seen in present § 4b.131 dealing with longitudinal control for reciprocating engine and turbine engine powered airplanes. This section specifies the trim speed prescribed in § 4b.112(c) though this trim speed is not applicable to turbine engine powered airplanes. The proposed § 25.103 specifies the proper trim speed for reciprocating engine and turbine engine powered airplanes. Similarly, other sections in Part 4b that apply to both reciprocating engine and turbine engine powered airplanes but contain requirements that could affect reciprocating engine powered airplanes only (such as requirements that manifold pressure limitations be established) have been revised appropriately. Some sections that apply to both reciprocating engine and turbine engine powered airplanes but by their terminology are limited to reciprocating engine powered airplanes (such as where "power" is called for) have been changed by including terms appropriate for turbine engine powered airplanes. Example of these changes may be found in proposed § 25.1163. This revised section limits the manifold pressure requirement to reciprocating engine powered airplanes and expands the time limit requirement for the use of "power" to include "thrust".

Present § 4b.329(b)(3) states that "the approved rating of ball and roller bearings shall not be exceeded" and § 4b.329-6 states that the "approved ratings" are those established in MIL HDBK-5. This requirement has been changed to allow the use of approved ratings other than those in MIL HDBK-5. The change is consistent with the FAA policy of allowing the use of approved recent developments in design and manufacturing.

Present §§ 4b.180 through 4b.182, Water handling characteristics, §§ 4b.-250 through 4b.258, Water loads, §§ 4b.-340 through 4b.342, Hulls and floats, and § 4b.636, Riding light, are requirements concerning airplanes that land on and take off from water only and those that have a capability to land on a runway as well as on water. This proposed part uses the terms "seaplane" and "amphibian", respectively, to describe these airplanes. The seaplanes and amphibians may use hulls or floats as a means of flotation for water landings. This terminology is proposed in order to do away with the present confusing use of the word "seaplane" to mean "seaplane and amphibian" and "float seaplane" only, and the use of the term "flying boat" for hull seaplanes.

Present Part 4b and SR 422B, as well as this proposed Part 25, contain references to "miles", "miles per hour", and "knots". Preliminary study indicates that this part, when finally adopted, should be uniform, using the nautical equivalents (nautical mile and knots) of "miles" and "miles per hour". The value will be adjusted so that no increase in burden will result. Comment is specifically invited on this matter.

This proposed part incorporates the amendment to Part 4b.334(e) published in the FEDERAL REGISTER April 22, 1964 (29 F.R. 5379).

When finally adopted, Part 25 [New] will include the substance of any applicable rules or amendments adopted and made effective during the period between the date of notice and the effective date of the final rule, and may also include applicable rules on which individual notices of proposed rule making have been issued and the comment period has expired; but which have not been theretofore adopted.

In consideration of the foregoing it is proposed to amend Chapter I of Title 14 of the Code of Federal Regulations by deleting Part 4b and adding a Part 25 [New] reading as hereinafter set forth.

This proposal is made under the authority of secs. 313(a), 601, and 603 of the Federal Aviation Act of 1958 (72 Stat. 752, 775, 776; 49 U.S.C. 1354(a), 1421, and 1423).

Issued in Washington, D.C., on May 14, 1964.

N. E. HALABY,
Administrator.

PART 25—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES

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Subpart A—General

§ 25.1 Applicability.

This part prescribes airworthiness requirements for issuing type certificates, and changes to those certificates, for transport category airplanes. Each person who applies under Part 21 [New] for a type certificate or a change to a type certificate must show that the airplane concerned meets the applicable requirements of this part.

[Revision note: Based on § 4b.0]

Subpart B—Flight Requirements

GENERAL

§ 25.11 Proof of compliance.

(a) Each applicant must show, by flight or other tests (or by calculations based upon tests if calculated results are substantially equal in accuracy to results obtainable by direct testing), that the airplane meets the requirements of this subpart.

(b) The airplane must meet the requirements of this subpart at all appropriate combinations of airplane weights and centers of gravity within the range of loading conditions for which certification is requested. This requires systematic investigation of all probable weight and center of gravity combinations unless compliance is reasonably inferable from those actually investigated.

(c) If there is less than 2 m.p.h. difference in the forward and rearward c.g. stalling speeds, all flying qualities may be based upon the forward c.g. stalling speeds.

(d) The controllability, stability, trim, and stalling characteristics of the airplane must be established at all altitudes up to the maximum anticipated operating altitude.

(e) The following general tolerances from specified values are allowed during flight testing. However, greater tolerances may be allowed in particular tests. These tolerances are plus or minus variations unless otherwise noted in the particular test:

Item	*Tolerance*
Weight	+5%, −10%.
Critical items affected by weight.	+5%, −1%.
C.G	7% total travel.
Airspeed	3 m.p.h. or 3%, whichever is greater.
Power	5%.
Wind (takeoff and landing tests).	As low as possible but not to exceed approximately 12% V_{S_1} or 12 m.p.h., whichever is lower, along the runway—measured at a height of six feet above the runway surface.

[Revision note: Combines §§ 4b.100 (less paragraph (d)–(g)), 4b.100–1 (b)(1) (first sentence only), and (b)(2), and 4b.100–3(b) (first sentence only)]

§ 25.13 Weight limitations.

(a) The maximum weight at which the airplane is suitable for operation may not exceed—

(1) The selected weight;

(2) The proven design maximum weight for the structure; or

(3) The maximum weight at which compliance with all of the applicable flight requirements of this subpart is shown.

(b) Maximum weights may be established for each altitude and for each practicably separable operating condition (such as takeoff, en route, and landing).

(c) The minimum weight at which the airplane is suitable for operation may not be less than—

(1) The selected weight;

(2) The proven design minimum weight for the structure; or

(3) The minimum weight at which compliance with all of the applicable flight requirements of this subpart is shown.

[Revision note: Based on § 4b.101]

§ 25.15 Center of gravity limitations.

(a) The extreme forward and the extreme aft center of gravity limitations must be established for each practicably separable operating condition.

(b) The limits of the center of gravity range may not exceed—

(1) The selected extremes;

(2) The extremes within which the structure is proven; or

(3) The extremes at which compliance with all of the applicable flight requirements of this subpart is shown.

[Revision note: Based on § 4b.102]

§ 25.17 Load distribution limitations.

(a) If a weight and center of gravity combination is allowable only within certain load distribution limits (such as spanwise) that could be inadvertently exceeded, these limits and the corresponding weight and center of gravity combinations must be established.

(b) The load distribution limits may not exceed—

(1) The selected limits;

(2) The limits at which the structure is proven; or

(3) The limits at which compliance with all of the applicable flight requirements of this subpart is shown.

[Revision note: Based on § 4b.103]

§ 25.19 Empty weight.

(a) The empty weight and the corresponding center of gravity position must be determined by weighing the airplane. The empty weight includes the weight of all fixed ballast, unusuable fuel supply established under § 25.677, undrainable oil, and the total quantity of the hydraulic fluid.

(b) The condition of the airplane at the time of weighing must be one which can be easily repeated and easily defined.

[Revision note: Based on § 4b.104]

§ 25.21 Use of ballast.

Removable ballast may be used in the airplane in order to comply with the flight requirements.

[Revision note: Based on § 4b.105]

PERFORMANCE FOR RECIPROCATING ENGINE POWERED AIRPLANES

§ 25.33 General.

(a) Reciprocating engine airplanes must meet the applicable performance requirements of this subpart for standard atmospheric conditions and still air. However, the effect of engine power on performance must be based on air of 80 percent relative humidity.

(b) Performance data required for a particular flight condition must be determined with each powerplant accessory absorbing the normal amount of power appropriate to that condition.

(c) Airplane performance data must be corrected in accordance with the following table:

Altitude H (ft.)	Vapor pressure e (In. Hg.)	Specific humidity w (Lb. moisture per lb. dry air)	Density ratio $\sigma=\frac{\rho}{0.0023769}$
0	0.403	0.00849	0.99508
1,000	.354	.00773	.96672
2,000	.311	.00703	.93895
3,000	.272	.00638	.91178
4,000	.238	.00578	.88514
5,000	.207	.00523	.85910
6,000	.1805	.00472	.83361
7,000	.1566	.00425	.80870
8,000	.1356	.00382	.78434
9,000	.1172	.00343	.76053
10,000	.1010	.00307	.73722
15,000	.0463	.001710	.62868
20,000	.01978	.000896	.53263
25,000	.00778	.000436	.44806

[Revision note: Combines §§ 4b.110 and 4b.110–1(a)]

§ 25.35 Wing flap positions.

The applicant must select takeoff, en route, approach, and landing wing flap positions. Flap positions may vary with weight and altitude.

[Revision note: Based on § 4b.111]

§ 25.37 Stalling speeds.

(a) V_{S_0} is the calibrated stalling speed, or the minimum steady flight speed at which the airplane is controllable, in miles per hour, with the—

(1) Engines idling, throttles closed (or at not more than that power required for zero thrust at a speed not greater than 110 percent of the stalling speed);

(2) Propeller pitch controls in the position normally used for takeoff;

(3) Landing gear extended;

(4) Wing flaps in the landing position;

(5) Cowl flaps closed;

(6) Center of gravity in the most unfavorable position within the allowable range for landing; and

(7) Weight of the airplane equal to the weight used when V_{S_0} is being used as a factor to determine a required performance.

(b) V_{S_1} is the calibrated stalling speed, or the minimum steady flight speed at which the airplane is controllable, in miles per hour, with the—

(1) Engines idling, throttles closed (or at not more than that power required for zero thrust at a speed not greater than 110 percent of the stalling speed);

(2) Propeller pitch controls in the position normally used for takeoff;

(3) Airplane in the condition existing in the particular test in connection with which V_{S_1} is being used; and

(4) Weight of the airplane equal to the weight used when V_{S_1} is being used as a factor to determine a required performance.

(c) The stall speeds V_{S_0} and V_{S_1} are the minimum speeds obtained in flight tests conducted as follows:

(1) From a speed enough above the probable stall speed to ensure steady con-

ditions, apply the elevator control at a rate so that the airplane speed reduction does not exceed one mile per hour per second.

(2) During these tests—

(i) Airplanes must be trimmed at 1.4 V_{S_1} except that airplanes with adjustable stabilizers may be trimmed at any speed from 1.2 V_{S_1} to 1.4 V_{S_1}; and

(ii) The flight requirements of § 25.141 must be complied with.

[Revision note: Based on § 4b.112]

§ 25.39 Takeoff; general.

(a) The takeoff speed described in § 25.41, the accelerate-stop distance described in § 25.43, and the takeoff path described in § 25.45, must be determined—

(1) At all selected weights and altitudes;

(2) With a constant takeoff flap position for the particular weight and altitude; and

(3) With the operating engines within their approved limitations.

(b) The takeoffs made for the purpose of determining the data required by paragraph (a) of this section may not require exceptional piloting skill or alertness. The takeoffs must be made on—

(1) A smooth, dry, hard-surfaced runway, in the case of landplanes or amphibians;

(2) Smooth water, in the case of seaplanes and amphibians; and

(3) Smooth, dry snow, in the case of seaplanes.

(c) Temperature accountability corrections must be made.

[Revision note: Based on § 4b.113]

§ 25.41 Takeoff speeds.

(a) The selected critical-engine-failure speed V_1, in terms of calibrated airspeed, must be at least the minimum speed at which controllability is shown (during the takeoff run) to be adequate to safely continue the takeoff, using normal piloting skill, when the critical engine is suddenly made inoperative. This paragraph does not apply if the engine failure is assumed to occur at V_2 or above.

(b) The minimum takeoff safety speed V_2, in terms of calibrated airspeed, must be selected so as to allow the rate of climb required in § 25.51 (a) and (b). However, V_2 may not be less than—

(1) 1.2 V_{S_1} for two-engine airplanes;

(2) 1.15 V_{S_1} for airplanes with more than two engines; or

(3) 1.10 times the minimum control speed V_{MC} established under § 25.107.

[Revision note: Based on § 4b.114]

§ 25.43 Accelerate-stop distance.

(a) Accelerate-stop distance is the sum of—

(1) The distance required to accelerate from a standing start to the speed V_1; and

(2) The distance required to bring the airplane to a full stop from the point corresponding to the speed V_1, assuming that the critical engine fails at the speed V_1.

(b) In addition to or instead of wheel brakes, other braking means may be used to determine the accelerate-stop distance if that means—

(1) Is safe and reliable;

(2) Is used so that consistent results can be expected under normal operating conditions; and

(3) Is such that exceptional skill is not required to control the airplane.

(c) The landing gear must remain extended throughout the accelerate-stop distance.

[Revision note: Based on § 4b.115]

§ 25.45 Takeoff path.

(a) The takeoff path consists of the following elements:

(1) The distance required to accelerate to the speed V_2, assuming the critical engine fails at the speed V_1.

(2) The horizontal distance traversed, and the height reached, by the airplane in the time required to retract the landing gear when operating at the speed V_2, with the critical engine inoperative and

(i) The propeller of the inoperative engine windmilling and its control in a position normally used during takeoff until (if applicable) the rotation is stopped; and

(ii) The propeller of the inoperative engine feathered (if applicable) for the remainder of the gear retraction time.

(3) If applicable, the horizontal distance traversed and the height attained by the airplane in the time elapsed from the end of the element in subparagraph (a)(2) of this section until the rotation of the propeller of the inoperative engine is stopped when the—

(i) Operation of stopping the propeller is initiated not earlier than the instant the airplane is 50 feet above the takeoff surface;

(ii) Airplane speed is equal to V_2;

(iii) Landing gear is retracted; and

(iv) Propeller of the inoperative engine is windmilling with the propeller control in a position normally used during takeoff.

(4) If applicable, the horizontal distance traversed, and the height reached, by the airplane in the time elapsed from the end of the element in subparagraph (3) of this paragraph (a) until the time limit on the use of takeoff power is reached, while operating at the speed V_2, with—

(i) The propeller of the inoperative engine stopped; and

(ii) The landing gear retracted.

(5) The slope of the flight path followed by the airplane in the configuration of the element in subparagraph (4) of this paragraph (a), with not more than maximum continuous power on the operating engine(s).

(b) For airplanes with automatically feathering propellers, if the net work produced by the feathering propeller, from the instant of engine failure to completion of feathering under all types of engine failure, is positive (using a datum based on feathered propeller drag), it may be assumed that the propeller of the failed engine is in the feathered drag condition from the instant of attainment of the takeoff climb speed V_2.

[Revision note: Combines §§ 4b.116 and 4b.116-1]

§ 25.47 Temperature accountability.

(a) Operating correction factors (to account for temperatures above and below standard) must be determined for takeoff weight and takeoff distance. Approved operating correction factors must be recorded in the Airplane Flight Manual.

(b) For each airplane type, the average full temperature accountability must be computed for the range of weights of the airplane, altitudes above sea level, and ambient temperatures, required by the expected operating conditions. The effect of temperature on the aerodynamic characteristics of the airplane and on engine power must be considered. There must be a full temperature accountability expressed per degree of temperature, in terms of a weight correction, a takeoff distance correction, and a change, if any, in the critical-engine-failure speed V_1.

(c) The operating correction factors for the airplane weight and takeoff distance must be at least one-half of the full accountability values. The value of V_1 must be further corrected by the average amount necessary to ensure that the airplane can stop within the runway length at the ambient temperature. However, the corrected value of V_1 may not be less than the minimum at which the airplane can be controlled with the critical engine inoperative.

[Revision note: Based on § 4b.117]

§ 25.49 Climb—all engines operating.

(a) *Cruising configuration.* The steady rate of climb in feet per minute at 5,000 feet, in the cruising configuration, must be at least 8 V_{S_0} (that is, the number of feet per minute is obtained by multiplying the number of miles per hour by 8). In addition, the steady rate of climb must be determined at any altitude at which the airplane is expected to operate and at any weight for which certification is requested. The steady rate of climb must be shown with the—

(1) Landing gear fully retracted;

(2) Wing flaps in the most favorable position;

(3) Cowl flaps (or other means of controlling the engine cooling air supply) in the position that provides adequate cooling in the hot-day condition;

(4) Center of gravity in the most unfavorable position;

(5) Engines operating within the maximum continuous power limitations; and

(6) Maximum takeoff weight.

(b) *Landing configuration.* The steady rate of climb in feet per minute in the landing configuration must be at least 0.07 $V_{S_0}^2$ at any altitude within the range of altitudes in which landing weight is certificated, and must be shown under the following conditions:

(1) Landing gear extended.

(2) Wingflaps in the landing position.

(3) Cowl flaps in the position normally used in an approach to a landing.

(4) The center of gravity in the most unfavorable position allowed for landing.

(5) All engines operating at the takeoff power available at that altitude.

(6) The weight equal to maximum landing weight for that altitude.

(7) A climb speed not in excess of 1.4 V_{S_0}.

[Revision note: Based on § 4b.119]

§ 25.51 One-engine-inoperative climb.

(a) *Flaps in takeoff position; landing gear extended.* The steady rate of climb without ground effect must be at least 50 ft./min. at any altitude within the range of altitudes in which takeoff weight is certificated, and must be shown under the following conditions:

(1) Wing flaps in the takeoff position.

(2) Cowl flaps in the position normally used during takeoff.

(3) The center of gravity in the most unfavorable position allowed for takeoff.

(4) The critical engine inoperative and, except as provided in paragraph (c) of this section, its propeller windmilling with the propeller control in a position normally used during takeoff.

(5) All other engines operating at the takeoff power available at that altitude.

(6) The speed equal to the minimum takeoff safety speed V_2.

(7) The weight equal to maximum takeoff weight for that altitude.

(8) Landing gear extended.

(b) *Flaps in takeoff position; landing gear retracted.* With the landing gear retracted, the steady rate of climb in feet per minute must be at least 0.035 $V_{S_1}{}^2$ with all other conditions as described in paragraph (a) of this section.

(c) *Use of automatic feathering installation.* The propeller of the inoperative engine may be in the feathered condition during the landing gear extended or retracted conditions if—

(1) The propeller would be completely feathered at the beginning of these segments of the takeoff flight path; or

(2) It is shown that the net work produced by the feathering propeller during the segment is positive, using a datum based on feathered propeller drag.

(d) *Flaps in en route position.* The steady rate of climb in feet per minute, at any altitude at which the airplane is expected to operate, and at any weight within the range of weights for which certification is requested, must be determined. At a standard altitude of 5,000 feet and at the maximum takeoff weight, this rate must be at least

$$\left(0.06-\frac{0.08}{N}\right)V_{S_0}{}^2,$$

where N is the number of engines installed. The steady rate of climb must be shown with the—

(1) Landing gear retracted;

(2) Wing flaps in the most favorable position;

(3) Cowl flaps (or other means of controlling the engine cooling air supply) in the position that provides adequate cooling in the hot-day condition;

(4) Center of gravity in the most unfavorable position;

(5) Critical engine inoperative and its propeller stopped; and

(6) Remaining engines operating at the maximum continuous power available at that altitude.

(e) *Flaps in approach position.* The steady rate of climb in feet per minute must be at least 0.04 $V_{S_0}{}^2$ at any altitude within the range of altitudes for which landing weight is certificated, and must be shown with the

(1) Landing gear retracted;

(2) Wing flaps set in position so that V_{S_1} does not exceed 1.10 V_{S_0};

(3) Cowl flaps in the position normally used during an approach to a landing;

(4) Center of gravity in the most unfavorable position allowed for landing;

(5) Critical engine inoperative and its propeller stopped;

(6) Remaining engines operating at the takeoff power available at that altitude;

(7) Weight equal to the maximum landing weight for that altitude; and

(8) Climb speed not in excess of 1.5 V_{S_1}.

[Revision note: Combines §§ 4b.120 and 4b.120-1]

§ 25.53 Two-engine inoperative climb (for airplanes with four or more engines).

For airplanes with four or more engines, the steady rate of climb at any altitude at which the airplane is expected to operate, and at any weight within the range of weights specified in the Airplane Flight Manual, must be determined with the—

(a) Landing gear retracted;

(b) Wing flaps in the most favorable position;

(c) Cowl flaps (or other means of controlling the engine cooling air supply) in the position that provides adequate cooling in the hot-day condition;

(d) Center of gravity in the most unfavorable position;

(e) Two critical engines on one side of the airplane inoperative and their propellers stopped; and

(f) Remaining engines operating at the maximum continuous power available at that altitude.

[Revision note: Based on § 4b.121]

§ 25.55 Landing distance.

(a) The landing distance is the horizontal distance required to land and to come to a complete stop (or to a speed of approximately 3 m.p.h. for water landings) from a point at a height of 50 feet above the landing surface must be determined (for the range of weights and altitudes selected by the applicant) under the following conditions:

(1) Maintain a steady gliding approach down to the 50-foot altitude, with a calibrated airspeed of not less than 1.3 V_{S_0}. The nose of the airplane may not be depressed, nor the forward thrust increased by application of power after reaching the 50-foot altitude.

(2) At all times during and immediately before the landing, the flaps must be in the landing position, except that, after the airplane is on the landing surface and the calibrated airspeed has been reduced to not more than 0.9 V_{S_0}, the flap position may be changed.

(3) The landing must be made without excessive vertical acceleration, tendency to bounce, nose over, ground loop, porpoise, or water loop.

(4) Landings for the purpose of determining the data required by this paragraph may not require exceptionally favorable conditions.

(b) For landplanes and amphibians, the determination of landing distance on land must be made on a level, smooth, dry, hardsurfaced runway. In addition—

(1) The operating pressures on the wheel braking system may not be in excess of those specified by the brake manufacturers;

(2) The wheel brakes may not be used so as to cause tire skidding or excessive heating of the brakes requiring replacement during a series of five official test landings; and

(3) In addition to, or instead of, wheel brakes other braking means may be used, if that means—

(i) Is safe and reliable;

(ii) Is used so that consistent results can be expected in service; and

(iii) Is such that exceptional skill is not required to control the airplane.

(c) For seaplanes and amphibians, the determination of landing distance on water must be made on smooth water.

(d) For skiplanes, the determination of landing distance on snow must be made on smooth, dry snow.

[Revision note: Combines §§ 4b.122, 4b.123, 4b.123-1, 4b.124, and 4b.125]

PERFORMANCE FOR TURBINE ENGINE POWERED AIRPLANES

§ 25.63 General.

(a) Turbine-powered airplanes must meet the applicable performance requirements of this subpart for ambient atmospheric conditions and still air, unless otherwise prescribed.

(b) The performance, as affected by engine power or thrust, must be based on a relative humidity of 80 percent, at and below standard temperatures, and on 34 percent, at and above standard temperatures plus 50° F. Between these two temperatures the relative humidity must vary linearly.

(c) The performance must correspond to the propulsive thrust available under the particular ambient atmospheric conditions, the particular flight condition, and the relative humidity specified in paragraph (b) of this section. The available propulsive thrust must correspond to engine power or thrust, not exceeding the approved power or thrust, less—

(1) The installation losses; and

(2) The power or equivalent thrust absorbed by the accessories and services appropriate to the particlar ambient atmospheric conditions and the particular flight condition.

[Revision note: Based on § 4T.110 (less (a))]

§ 25.65 Airplane configuration, speed, power or thrust; general.

(a) Unless otherwise prescribed, the applicant for a type certificate must select the takeoff, enroute, approach, and landing configurations for the airplane.

(b) The airplane configurations may vary with weight, altitude, and temperature, to the extent found by the Administrator to be compatible with the operating procedures required by paragraph (c) of this section.

(c) Except as otherwise prescribed, in determining the accelerate-stop distances, takeoff flight paths, takeoff distances, and landing distances, changes in the airplane's configuration, speed, power, and thrust, must be made in accordance with procedures established by the applicant for the operation of the airplane in service. In addition, procedures for the execution of balked landings and missed approaches associated with the conditions prescribed in §§ 25.85 and 25.87(d) must be established. All procedures must—

(1) Be found by the Administrator to be able to be consistently executed in service by crews of average skill;

(2) Use methods or devices that are safe and reliable; and

(3) Include allowance for all time delays, in the execution of the procedures, that may reasonably be expected in service.

[Revision note: Based on § 4T.111]

§ 25.67 Stalling speeds.

(a) V_S is the calibrated stalling speed, or the minimum steady flight speed at which the airplane is controllable, in knots, with—

(1) Zero thrust at the stalling speed, or, if it is shown that the resultant thrust has no appreciable effect on the stalling speed, with engines idling and throttles closed;

(2) Propeller pitch controls (if applicable) in the position necessary for compliance with subparagraph (1) of this paragraph and the airplane in all other respects (such as flaps and landing gear) in the condition existing in the particular test in connection with which V_S is being used;

(3) The weight of the airplane equal to the weight used when V_S is being used as a factor to determine a required performance; and

(4) The center of gravity in the most unfavorable position within the allowable range.

(b) The stalling speed V_S is the minimum speed obtained as follows:

(1) Trim the airplane for straight flight at any speed sufficiently above the probable stall speed to ensure steady conditions, but not less than 1.2 V_S nor more than 1.4 V_S. At this speed, apply the elevator control at a rate so that the airplane speed reduction does not exceed one knot per second.

(2) Comply with the flight characteristics provisions of § 25.141.

[Revision note: Based on § 4T.112 ((a) and (b))]

§ 25.69 Minimum control speeds.

(a) V_{MC} is the minimum control speed, in terms of calibrated air speed, at which, when the critical engine is suddenly made inoperative, it is possible to recover control of the airplane (with the engine still inoperative) and to maintain it in straight flight at this speed, either with zero yaw or, at the option of the applicant, with an angle of bank not more than 5 degrees. V_{MC} may not exceed 1.2 V_S with—

(1) The engines operating at the maximum available takeoff power or thrust;

(2) The maximum sea level takeoff weight or any lesser weight necessary to demonstrate V_{MC};

(3) The airplane in the most critical takeoff configuration existing along the flight path after the airplane becomes airborne, except with the landing gear retracted;

(4) The airplane trimmed for takeoff;

(5) The airplane airborne and the ground effect negligible; and

(6) The center of gravity in the most unfavorable position.

(b) In showing the minimum control speed, the rudder force required to maintain control may not exceed 180 pounds and it may not be necessary to reduce power or thrust of the operative engines.

(c) During recovery from the maneuver performed during the demonstration of the minimum control speed, the airplane may not assume any dangerous attitude nor require exceptional skill, strength, or alertness, on the part of the pilot, to prevent a change in heading in excess of 20 degrees, before recovery is complete.

[Revision note: Based on § 4T.112 less (a) and (b)]

§ 25.71 Takeoff; general.

(a) The takeoff speed described in § 25.73, the accelerate-stop distance described in § 25.75, the takeoff path described in § 25.77, and the takeoff distance and takeoff run described in § 25.79, must be determined—

(1) At all weights, altitudes, and ambient temperatures, within the selected operational limits for the airplane; and

(2) In the selected configuration for takeoff.

(b) The takeoffs made for the purpose of determining the data required by paragraph (a) of this section may not require exceptional piloting skill or alertness. The takeoffs must be made on—

(1) A smooth, dry, hard-surfaced runway, in the case of land planes and amphibians;

(2) Smooth water, in the case of seaplanes and amphibians; and

(3) Smooth, dry snow, in the case of skiplanes.

(c) The takeoff data must include, within the established operational limits of the airplane, the following operational correction factors for wind and runway gradients:

(1) Not more than 50 percent of nominal wind components along the takeoff path opposite to the direction of takeoff, and not less than 150 percent of nominal wind components along the takeoff path in the direction of takeoff.

(2) Effective runway gradients.

[Revision note: Based on § 4T.113]

§ 25.73 Takeoff speeds.

(a) The selected critical-engine-failure speed V_1, in terms of calibrated air speed, must be at least the minimum speed at which controllability by primary aerodynamic controls alone is shown (during the takeoff run) to be adequate to safely continue with the takeoff, using normal piloting skill, when the critical engine is suddenly made inoperative.

(b) The minimum takeoff safety speed $V_{2\,min}$, in terms of calibrated air speed, may not be less than—

(1) 1.2 V_S for—

(i) Two-engine and three-engine turbopropeller powered airplanes; and

(ii) Turbojet powered airplanes without provisions for obtaining a significant reduction in the one-engine-inoperative power on stalling speed;

(2) 1.15 V_S for—

(i) Turbopropeller powered airplanes with more than three engines; and

(ii) Turbojet powered airplanes with provisions for obtaining a significant reduction in the one-engine-inoperative power-on stalling speed; and

(3) 1.10 times the minimum control speed V_{MC} established in accordance with § 25.69.

(c) The selected takeoff safety speed V_2, in terms of calibrated air speed, must allow the gradient of climb required by § 25.87(b) (formerly § 4T.120(b)) but may not be less than the—

(1) Minimum takeoff safety speed $V_{2\,min}$; and

(2) Rotation speed V_R

plus the speed increment attained (in accordance with § 25.77(c)(2)) before reaching a height of 35 feet above the takeoff surface.

(d) The minimum unstick speed V_{MU}, in terms of calibrated air speed, is the speed at and above which the airplane can lift off the ground, and to continue the takeoff, without showing hazardous characteristics. V_{MU} speeds must be selected for the all-engines-operating and the one-engine-inoperative conditions. The V_{MU} speeds may be established from free air data if these data are verified by ground takeoff tests.

(e) The rotation speed V_R, in terms of calibrated air speed, must be selected in accordance with the conditions of subparagraphs (1) thru (4) of this paragraph:

(1) The rotation speed V_R may not be less than—

(i) The speed V_1;

(ii) The speed equal to 105 percent of V_{MC};

(iii) The speed (determined in accordance with § 25.77(c)(2)) that allows reaching the speed V_2 before reaching a height of 35 feet above the takeoff surface; or

(iv) A speed which, if the airplane is rotated at its maximum practicable rate, will result in a lift-off speed V_{LOF} of not less than 110 percent of V_{MU} in the all-engines-operating condition nor less than 105 percent of V_{MU} in the one-engine-inoperative condition.

(2) For any given set of conditions (such as weight, configuration, and temperature), a single value of V_R speed, obtained in accordance with this paragraph, must be used to show compliance with both the one-engine-inoperative and the all-engines-operating takeoff provisions.

(3) It must be shown that the one-engine-inoperative takeoff distance, using a rotation speed of 5 knots less than the V_R speed established in accordance with subparagraphs (1) and (2) of this paragraph, does not exceed the corresponding one-engine-inoperative takeoff distance using the established V_R speed. The takeoff distances must be determined in accordance with § 25.79(a)(1).

(4) It must be shown that reasonably expected variations in service from the established takeoff procedures for the operation of the airplane (such as over-rotation of the airplane and out-of-trim conditions) do not result in unsafe flight characteristics nor in marked increases in the scheduled takeoff distances established in accordance with § 25.79(a).

(f) The lift-off speed V_{LOF}, in terms of calibrated air speed, is the speed at which the airplane first becomes airborne.

[Revision note: Based on § 4T.114]

§ 25.75 Accelerate-stop distance.

(a) Accelerate-stop distance is the sum of—

(1) The distance required to accelerate the airplane from a standing start to the speed V_1; and

(2) The distance required to bring the airplane to a full stop from the point corresponding to the speed V_1, assuming that the critical engine fails at the speed V_1.

(b) In addition to, or instead of, wheel brakes, other braking means may be used to determine the accelerate-stop distance if that means—

(1) Is safe and reliable;

(2) Is used so that consistent results can be expected under normal conditions of operations; and

(3) Is such that exceptional skill is not required to control the airplane.

(c) The landing gear must remain extended throughout the accelerate-stop distance.

(d) If the accelerate-stop distance is determined using a stopway with surface characteristics substantially different from those of a smooth hard-surfaced runway, the takeoff data must include operational correction factors for the accelerate-stop distance. The correction factors must account for the particular surface characteristics of the stopway and the variations in these characteristics with seasonal weather conditions (such as temperature, rain, snow, and ice) within the established operational limits.

(e) As used in this section, a stopway is an area beyond the runway that is—

(1) Not less in width than the width of the runway;

(2) Centrally located about the extended center line of the runway;

(3) Capable of supporting the airplane during an aborted takeoff without inducing structural damage to the airplane; and

(4) Designated by the airport authorities for use in decelerating the airplane during an aborted takeoff.

[Revision note: Combines § 4T.115 and item 5 (less (a)) of SR 422B]

§ 25.77 Takeoff path.

(a) The takeoff path extends from a standing start to a point in the takeoff where the airplane is 1,500 feet above the takeoff surface, or where the transition from the takeoff to the en route configuration is completed and a speed is reached at which compliance with § 25.87 (c) is shown, whichever point is higher. In addition—

(1) The takeoff path must be based on the procedures prescribed in § 25.65 (c);

(2) The airplane must be accelerated on the ground to the speed V_1, at which point the critical engine must be made inoperative and must remain inoperative for the remainder of the takeoff; and

(3) After reaching speed V_1, the airplane must be accelerated to speed V_2.

(b) During the acceleration to speed V_2, it is allowable to initiate raising the nose gear off the ground at a speed not less than the rotation speed V_R. However, landing gear retraction may not be initiated until the airplane becomes airborne.

(c) During the takeoff path determination in accordance with paragraphs (a) and (b) of this section—

(1) The slope of the airborne portion of the takeoff path must be positive at all points;

(2) The airplane must attain the speed V_2 before it is 35 feet above the takeoff surface and must continue at a speed as close as practical to, but not less than V_2, until it is 400 feet above the takeoff surface;

(3) At all points along the takeoff path, starting at the point where the airplane first is 400 feet above the takeoff surface, the available gradient of climb may not be less than 1.2 percent for two-engine airplanes, 1.5 percent for three-engine airplanes, and 1.7 percent for four-engine airplanes; and

(4) The airplane configuration may not be changed before the airplane is 400 feet above the takeoff surface except for gear retraction and propeller feathering.

(d) The takeoff path must be determined either by a continuous demonstrated takeoff or by synthesizing it from segments. If the takeoff path is determined by the segmental method—

(1) The segments of a segmental takeoff path must be clearly defined and must be related to the distinct changes in the configuration of the airplane, in power or thrust, and in speed;

(2) The weight of the airplane, the configuration, and the power or thrust must be constant throughout each segment and must correspond to the most critical condition prevailing in the particular segment;

(3) The segmental flight path must be based on the airplane's performance without ground effect; and

(4) Segmental takeoff path data must be checked by continuous demonstrated takeoffs up to the point where the airplane's performance is out of ground effect and the airplane's speed is stabilized, to ensure that the segmental path is conservative relative to the continuous path.

[Revision note: Based on § 4T.116]

§ 25.79 Takeoff distance and takeoff run.

(a) Takeoff distance is the greater of—

(1) The horizontal distance along the takeoff path from the start of the takeoff to the point where the airplane is 35 feet above the takeoff surface, determined in accordance with § 25.77; or

(2) A distance equal to 115 percent of the horizontal distance along the takeoff path, with all engines operating, from the start of the takeoff to the point where the airplane is 35 feet above the takeoff surface, as determined by a procedure consistent with § 25.77.

(b) If the takeoff distance includes a clearway, the takeoff run must be determined as the greater of—

(1) The horizontal distance along the takeoff path from the start of the takeoff to a point equidistant between the point where the speed V_{LOF} is reached and the point where the airplane is 35 feet above the takeoff surface, as determined in accordance with § 25.77; or

(2) A distance equal to 115 percent of the horizontal distance along the takeoff path, with all engines operating, from the start of the takeoff to a point equidistant between the point where the speed V_{LOF} is reached and the point where the airplane is 35 feet above the takeoff surface, determined by a procedure consistent with § 25.77.

(c) As used in this section, a clearway is an area beyond the runway, not less than 500 feet wide, centrally located about the extended center line of the runway, and under the control of the airport authorities. The clearway is expressed in terms of a clearway plane, extending from the end of the runway with an upward slope not exceeding 1.25 percent, above which no object nor any portion of the terrain protrudes. However, threshold lights may protrude above the plane if their height above the end of the runway is 26 inches or less and if they are located to each side of the runway. For the purpose of establishing takeoff distances and takeoff runs, the clearway plane is considered to be the takeoff surface.

[Revision note: Combines § 4T.117 and paragraph (a) of item 5 of SR 422B]

§ 25.81 Takeoff flight path.

(a) The takeoff flight path begins 35 feet above the takeoff surface at the end of the takeoff distance determined in accordance with § 25.79(a).

(b) The net takeoff flight path data must be determined so that they represent the airplane's actual takeoff flight paths (determined in accordance with § 25.77 and with paragraph (a) of this section) reduced at each point by a gradient of climb equal to 0.8 percent for two-engine airplanes, 0.9 percent for three-engine airplanes, and 1.0 percent for four-engine airplanes. The prescribed reduction in climb gradient may be applied as an equivalent reduction in the airplane's acceleration along that portion of the actual takeoff flight path where the airplane is accelerated in level flight.

[Revision note: Based on § 4T.117a]

§ 25.83 Climb: general.

Compliance with the requirements of §§ 25.85 and 25.87 must be shown at all weights, altitudes, and ambient temperatures within the operational limits established for the airplane. In addition, the airplane center of gravity corresponding to each configuration must be in the most unfavorable position.

[Revision note: Based on § 4T.118]

§ 25.85 All-engine-operating landing climb.

In the landing configuration, the steady gradient of climb may not be less than 3.2 percent, with—

(a) All engines operating at the power or thrust that is available 8 seconds after initiation of movement of the power or thrust controls from the minimum flight idle to the takeoff position; and

(b) A climb speed of not more than 1.3 V_S.

[Revision note: Based on § 4T.119]

§ 25.87 One-engine-inoperative climb.

(a) *Takeoff; landing gear extended.* In the critical takeoff configuration existing along the flight path (between the points where the airplane reaches the speed V_{LOF} and where the landing gear is fully retracted) and in the configuration used in § 25.77 but without ground effect, the steady gradient of climb must be positive for two-engine airplanes, and not less than 0.3 percent for three-engine airplanes or 0.5 percent for four-engine airplanes, with—

(1) The critical engine inoperative and the remaining engines operating at the available power or thrust existing at the time retraction of the landing gear is initiated in accordance with § 25.77, unless there is a more critical power operating condition existing later along the flight path but before the point where the landing gear is fully retracted;

(2) The airplane weight equal to the weight existing at the time retraction of the landing gear is initiated, determined in accordance with § 25.77; and

(3) The speed equal to the speed V_{LOF}.

(b) *Takeoff; landing gear retracted.* In the takeoff configuration existing at the point of the flight path where the landing gear is fully retracted, and in the configuration used in § 25.77 but without ground effect, the steady gradient of climb may not be less than 2.4 percent for two-engine airplanes, 2.7 percent for three-engine airplanes, and 3.0 percent for four-engine airplanes, with—

(1) The critical engine inoperative, the remaining engines operating at the available takeoff power or thrust existing at the time the landing gear is fully retracted in accordance with § 25.77 unless there is a more critical power operating condition existing later along the flight path but before the point where the airplane reaches a height of 400 feet above the takeoff surface;

(2) The airplane weight equal to the weight existing at the time the airplane's landing gear is fully retracted, determined under § 25.77; and

(3) The speed equal to the speed V_2.

(c) *Final takeoff.* In the en route configuration at the end of the takeoff path determined in accordance with § 25.77, the steady gradient of climb may not be less than 1.2 percent for two-engine airplanes, 1.5 percent for three-engine airplanes, and 1.7 percent for four-engine airplanes, with—

(1) The critical engine inoperative, the remaining engines operating at the available maximum continuous power or thrust;

(2) The airplane weight equal to the weight existing at the end of the takeoff path, determined in accordance with § 25.77; and

(3) The speed equal to not less than 1.25 V_S.

(d) *Approach.* In the approach configuration corresponding to the normal all-engines-operating procedure in which V_S for this configuration does not exceed 10 percent of the V_S for the related landing configuration, the steady gradient of climb may not be less than 2.1 percent for two-engine airplanes, 2.4 percent for three-engine airplanes, and 2.7 percent for four-engine airplanes, with—

(1) The critical engine inoperative, the remaining engines operating at the available takeoff power or thrust;

(2) The weight equal to the maximum landing weight; and

(3) A climb speed established in connection with normal landing procedures, but not exceeding 1.5 V_S.

[Revision note: Based on § 4T.120]

§ 25.89 En route flight paths.

(a) For the en route configuration, the flight paths prescribed in paragraphs (b) and (c) of this section must be determined at all weights, altitudes, and ambient temperatures, within the operating limits established for the airplane. The flight paths must be determined at any selected speed, with—

(1) The center of gravity in the most unfavorable position;

(2) The critical engines inoperative;

(3) The remaining engines operating at the available maximum continuous power or thrust; and

(4) The means for controlling the engine cooling air supply in the position that provides adequate cooling in the hot-day condition.

(b) The one-engine-inoperative net flight path data must represent the airplane's actual climb performance diminished by a gradient of climb equal to 1.1 percent for two-engine airplanes, 1.4 percent for three-engine airplanes, and 1.6 percent for four-engine airplanes. The variation of the airplane's weight along the flight path, taking into account the progressive consumption of fuel and oil by the operating engines, may be included in the computation.

(c) For airplanes with three or four-engines, the two-engine-inoperative net flight path data must represent the airplane's actual climb performance diminished by a gradient of climb equal to 0.3 percent for three-engine airplanes and 0.5 percent for four-engine airplanes. The variation of the airplane's weight along the flight path, taking into account the progressive consumption of fuel and oil by the operating engines, may be included in the computation.

[Revision note: Based on § 4T.121]

§ 25.91 Landing distance.

(a) The landing distance is the horizontal distance required to land and to come to a complete stop (or to a speed of approximately 3 knots for water landings) from a point at a height of 50 feet above the landing surface, this must be determined for standard temperatures, at all weights, altitudes, and winds, within the operational limits established by the applicant for the airplane. This determination must be made under the following conditions:

(1) The airplane must be in the landing configuration.

(2) The landing must be preceded by a steady gliding approach, down to the 50-foot height, with a calibrated airspeed of not less than 1.3 V_S.

(3) During landing—

(i) Changes in the airplane configuration, power or thrust, and speed, must be made in accordance with the established procedures for the operation of the airplane in service; and

(ii) The airplane may not show excessive vertical acceleration, tendency to bounce, nose over, ground loop, porpoise or water loop.

(4) Landings for the purpose of determining the landing distance may not require exceptional piloting skill or alertness.

(b) For landplanes and amphibians, the determination of landing distance on land must be made on a level, smooth, dry, hard surfaced runway. In addition—

(1) The operating pressures on the wheel braking systems may not be in excess of those specified by the brake manufacturer;

(2) The wheel brakes may not be used so as to produce excessive wear of brakes or tires; and

(3) In addition to, or instead of, wheel brakes, other braking means may be used if that means—

(i) Is safe and reliable;

(ii) Is used so that consistent results can be expected in service; and

(iii) Is such that exceptional skill is not required to control the airplane.

(c) For seaplanes and amphibians, the determination of the landing distance on water must be made on smooth water.

(d) For skiplanes, the determination of the landing distance on snow must be made on smooth, dry, snow

(e) The landing distance data must include operational correction factors for not more than 50 percent of the nominal wind components along the landing path opposite to the direction of landing, and not less than 150 percent of the nominal wind components along the landing path in the direction of landing.

(f) If any device is used that depends on the operation of any engine, and if the landing distance would be noticeably increased when a landing is made with that engine inoperative, the landing distance must be determined with that engine inoperative unless the Administrator finds that the use of compensating means will result in a landing distance not greater than that with all engines operating.

[Revision note: Based on § 4T.122]

CONTROLLABILITY

§ 25.101 Controllability; general.

(a) The airplane must be safely controllable and maneuverable during takeoff, climb, level flight, descent, and landing. It must be possible to make a smooth transition from any flight condition to another without an exceptional degree of skill, alertness, or strength on the part of the pilot and without danger of exceeding the limit-load factor under all conditions of operation probable for the type (including all conditions normally encountered when an engine suddenly fails).

(b) If, during the testing required by paragraph (a) of this section, the Administrator finds that marginal conditions exist with regard to the strength required of the pilot, quantitative testing must show that the "strength of pilots" limits do not exceed the limits prescribed in the following table:

Values in pounds of force as applied to the control wheel or rudder pedals.	Pitch	Roll	Yaw
For temporary application	75	60	180
For prolonged application	10	5	20

(c) For the purpose of complying with the temporary control force limitations of paragraph (b) of this section, the airplane must be operated in accordance with approved operating procedures or conventional operating practices (including being as nearly trimmed as possible at the next preceding steady flight condition, except that, in the case of takeoff, the airplane must be trimmed in accordance with approved operating procedures).

(d) For the purpose of complying with the prolonged control force limitations of paragraph (b) of this section, the airplane must be as nearly trimmed as possible.

[Revision note: Based on § 4b.130]

§ 25.103 Longitudinal control.

(a) It must be possible at all speeds between the trim speed prescribed in § 25.37(c)(2)(i) and V_{S_1} (for reciprocating engine-powered airplanes), or at all speeds between the trim speed prescribed in § 25.67(b)(1) and V_S (for turbine engine powered airplanes), to pitch the nose downward so that a prompt recovery to this selected trim speed can be made with—

(1) The airplane trimmed at the trim speed prescribed in § 25.37(c)(2)(i) (for reciprocating engine powered airplanes), or in § 25.67(b)(1) (for turbine engine powered airplanes);

(2) The landing gear extended;

(3) The wing flaps (i) retracted and (ii) extended; and

(4) (i) Power off and (ii) maximum continuous power on all engines.

(b) With the landing gear extended, no change in the trim control, nor exertion of more than 50 pounds control force, (representative of the maximum temporary force which readily can be applied by one hand) may be required for any of the following maneuvers:

(1) With power off, flaps retracted, and the airplane trimmed at 1.4 V_{S_1}, extend the flaps as rapidly as possible while maintaining the airspeed at approximately 40 percent above the stalling speed prevailing at any instant throughout the maneuver.

(2) Repeat subparagraph (1) except initially extend the flaps and then retract them as rapidly as possible.

(3) Repeat subparagraph (2) except use takeoff power.

(4) With power off, flaps retracted, and the airplane trimmed at 1.4 V_{S_1}, apply takeoff power rapidly while maintaining the same airspeed.

(5) Repeat subparagraph (4) except with flaps extended.

(6) With power off, flaps extended and the airplane trimmed at 1.4 V_{S_1}, obtain and maintain airspeeds between 1.1 V_{S_1} and the lower of 1.7 V_{S_1} or V_{FE}.

(c) It must be possible, without exceptional piloting skill, to prevent loss of altitude when wing flap retraction from any position is initiated during steady, straight, level flight at a speed equal to 1.1 V_{S_1} with—

(1) Simultaneous application of not more than maximum continuous power;

(2) The landing gear extended; and

(3) The maximum sea level landing weight.

[Revision note: Based on § 4b.131]

§ 25.105 Directional and lateral control.

(a) *Directional control; general.* It must be possible, while holding the wings approximately level, to safely execute reasonably sudden changes in heading in either direction. This must be shown at 1.4 V_{S_1} for heading changes up to 15° (except that the heading change at which the rudder pedal force is 180 pounds need not be exceeded), and with—

(1) The critical engine inoperative and its propeller in the minimum drag position;

(2) The power required for level flight at 1.4 V_{S_1}, but not more than maximum continuous power;

(3) The most unfavorable center of gravity position;

(4) Landing gear retracted;

(5) Wing flaps in the approach position; and

(6) Maximum landing weight.

(b) *Directional control; airplanes with four or more engines.* Airplanes with four or more engines must meet the requirements of paragraph (a) of this section except that—

(1) The two critical engines must be inoperative with their propellers (if applicable) in the minimum drag position;

(2) The center of gravity must be in the most forward position; and

(3) The wing flaps must be in the most favorable climb position.

(c) *Lateral control; general.* It must be possible to execute 20° banked turns, with and against the inoperative engine, from steady flight at a speed equal to 1.4 V_{S_1}, with—

(1) The critical engine inoperative and its propeller (if applicable) in the minimum drag position;

(2) Maximum continuous power on the operating engines;

(3) The most unfavorable center of gravity position;

(4) Landing gear (i) retracted and (ii) extended;

(5) Wing flaps in the most favorable climb position; and

(6) Maximum takeoff weight.

(d) *Lateral control; airplanes with four or more engines.* Airplanes with four or more engines must be able to execute 20° banked turns, with and against the inoperative engines, from steady flight at a speed equal to 1.4 V_{S_1}, with maximum continuous power, and with the airplane in the configuration prescribed by paragraph (b) of this section.

(e) *Lateral control; all engines operating.* With all engines operating, roll response must be rapid and great enough to allow normal maneuvers (such as recovery from upsets produced by gusts and the initiation of evasive maneuvers). There must remain enough excess lateral control in sideslips (up to sideslip angles that might be required in normal operation), to allow a limited amount of maneuvering and to correct for gusts. Lateral control must be enough at all speeds up to V_{FC}/M_{FC} to provide a peak roll rate necessary for safety, without requiring excessive control forces or excessive control travel.

[Revision note: Based on § 4b.132]

§ 25.107 Minimum control speed, for reciprocating engine powered airplanes.

(a) For reciprocating engine airplanes, the minimum speed must be determined at which, when the critical engine is suddenly made inoperative, it is possible to recover control of the airplane with that engine still inoperative, and maintain straight flight either with zero yaw or, at the option of the applicant, with an angle of bank of not more than five degrees. This speed may not exceed 1.2 V_{S_1} with—

(1) Take-off or maximum available power on all engines;

(2) The rearmost center of gravity;

(3) Flaps in the takeoff position;

(4) Landing gear retracted;

(5) Cowl flaps in the position normally used during takeoff;

(6) The maximum sea level takeoff weight (or any lesser weight that may be necessary to demonstrate V_{MC});

(7) The airplane trimmed for takeoff;

(8) The propeller of the inoperative engine—

(i) Windmilling;

(ii) In the most probable position for the specific design of the propeller control; or

(iii) Feathered, if the airplane has an automatic feathering device acceptable to the Administrator for showing compliance with the climb requirements of § 25.51; and

(9) The airplane airborne and the ground effect negligible.

(b) The rudder forces required to maintain control at V_{MC} may not exceed 180 pounds nor may it be necessary to throttle the remaining engines. During recovery, the airplane may not assume any dangerous attitude, nor require exceptional piloting skill, alertness, or strength to prevent a heading change of more than 20 degrees.

[Revision note: Based on § 4b.133]

TRIM

§ 25.111 Trim.

(a) *General.* The airplane must meet the trim requirements of this section after being trimmed, and without further pressure upon, or movement of, either the primary controls or their corresponding trim controls by the pilot or the automatic pilot.

(b) *Lateral and directional trim.* The airplane must maintain lateral and directional trim with the most adverse lateral displacement of the center of gravity within the relevant operating limitations, during all normally expected conditions of operation (including operation at any speed from 1.4 V_{S_1} to V_{MO}/M_{MO}).

(c) *Longitudinal trim.* The airplane must maintain longitudinal trim during—

(1) A climb with maximum continuous power at a speed not in excess of 1.4 V_{S_1}, with the landing gear retracted, and the wing flaps (i) retracted and (ii) in the takeoff position;

(2) A glide with power off at a speed not in excess of 1.4 V_{S_1}, with the landing gear extended, the wing flaps (i) retracted and (ii) extended, the most forward center of gravity position approved for landing with the maximum landing weight, and with the most forward center of gravity position approved for landing regardless of weight; and

(3) Level flight at any speed from 1.4 V_{S_1} to V_{MO}/M_{MO}, with the landing gear and wing flaps retracted, and from 1.4 V_{S_1} to V_{LE} with the landing gear extended.

(d) *Longitudinal, directional, and lateral trim.* The airplane must maintain longitudinal, directional, and lateral trim (and for lateral trim, the angle of bank may not exceed five degrees) at a speed equal to 1.4 V_{S_1} during climbing flight with—

(1) The critical engine inoperative;

(2) The remaining engines operating at maximum continuous power; and

(3) The landing gear and wing flaps retracted.

(e) *Trim for airplanes with four or more engines.* The airplane must maintain trim in rectilinear flight—

(1) At the climb speed, configuration, and power required by § 25.53 for the purpose of establishing the rate of climb;

(2) With the most unfavorable center of gravity position; and

(3) At the weight at which the two-engine-inoperative climb is equal to at least 0.01 $V_{S_0}{}^2$ at an altitude of 5,000 feet.

[Revision note: Combines §§ 4b.140, 4b.141, 4b.142, 4b.143, and 4b.144]

STABILITY

§ 25.121 General.

The airplane must be longitudinally, directionally, and laterally stable in accordance with the provisions of §§ 25.123–25.135. In addition, suitable stability is required in other conditions normally encountered in service, if flight tests show it is necessary for safe operation.

[Revision note: Based on § 4b.150]

§ 25.123 Static longitudinal stability.

Under the conditions specified in §§ 25.125 through 25.131, the characteristics of the elevator control forces (including friction) and the elevator control surface displacement must be as follows:

(a) A pull must be required to obtain and maintain speeds below the specified trim speed, and a push must be required to obtain and maintain speeds above the specified trim speed. In addition, if the elevator control forces are not dependent upon the hinge moments of the elevator control surface, it must also be shown that upward displacement of the elevator trailing edge is required to obtain and maintain speeds below the specified trim speed, and a downward displacement of the elevator trailing edge is required to obtain and maintain speeds above the specified trim speed. These criteria apply to any speed that can be obtained except that these speeds need not be greater than the landing gear or the wing flap operating limit speed, or V_{FC}/M_{FC}, whichever is appropriate, nor less than the minimum speed in steady, unstalled flight.

(b) The airspeed must return to within 10 percent of the original trim speed when the control force is slowly released from any speed within the limits defined in paragraph (a) of this section.

(c) The stable slope of the stick force versus speed curve may not be less than 0.5 pound for each three knots nor exceed a value beyond which control of the airplane is difficult.

[Revision note: Based on § 4b.151]

§ 25.125 Stability during landing.

The stick force curve and, if required by § 25.123(a), the elevator angle curve must have stable slopes, and the stick force may not exceed 80 pounds, at any speed between 1.1 V_{S_0} and 1.8 V_{S_0} with the—

(a) Wing flaps in the landing position;

(b) Landing gear extended;

(c) Maximum landing weight;

(d) Power or thrust off on all engines; and

(e) Airplane trimmed at 1.4 V_{S_0} with power or thrust off.

[Revision note: Based on § 4b.152]

§ 25.127 Stability during approach.

The stick force curve and, if required by § 25.123(a), the elevator angle curve must have stable slopes at all speeds between 1.1 V_{S_1} and 1.8 V_{S_1} with the—

(a) Wing flaps in the approach position;

(b) Landing gear retracted;

(c) Maximum landing weight; and

(d) Airplane trimmed at 1.4 V_{S_1} with enough power to maintain level flight at this speed.

[Revision note: Based on § 4b.153]

§ 25.129 Stability during climb.

The stick force curve and, if required by § 25.123(a), the elevator angle curve must have stable slopes at all speeds between 85 and 115 percent of the speed at which the airplane—

(a) Is trimmed, with—

(1) Wing flaps retracted;

(2) Landing gear retracted;

(3) Maximum takeoff weight; and

(4) 75 percent of maximum continuous power for reciprocating engines or the maximum power or thrust selected by the applicant as an operating limitation for use during climb for turbine engines; and

(b) Is trimmed at the best rate-of-climb speed except that the speed need not be less than 1.4 V_{S_1}.

[Revision note: Based on § 4b.154]

§ 25.131 Stability during cruising.

(a) *Landing gear retracted; high speed.* The stick force curve and, if required by § 25.123(a), the elevator angle curve must have stable slopes at all speeds from V_{FC}/M_{FC} to the lower of the speed equal to $V_{FC}-\left(\frac{V_{FC}-1.4\,V_{S_1}}{2}\right)$ or 50 knots less than the trim speed specified in subparagraph (4) of this paragraph (however, the speed need not be less than 1.4 V_{S_1}) and the stick force may not exceed 50 pounds with—

(1) Wing flaps retracted;

(2) The most critical weight between maximum landing weight and maximum takeoff weight;

(3) 75 percent of maximum continuous power for reciprocating engines or, for turbine engines, the maximum cruising power (though it need not exceed that power required at V_{MO}/M_{MO}) selected by the applicant as an operating limitation; and

(4) The airplane trimmed for level flight with the power required in subparagraph (3) of this paragraph.

(b) *Landing gear retracted; low speed.* The stick force curve and, if required by § 25.123(a), the elevator angle curve must have stable slopes at all speeds from a speed equal to $V_{FC}-\left(\frac{V_{FC}-1.4\,V_{S_1}}{2}\right)$ to 1.4 V_{S_1}. At altitudes where Mach number is critical, the calibrated airspeed corresponding to M_{FC} may be used to calculate the speed

$$V_{FC}-\left(\frac{V_{FC}-1.4\,V_{S_1}}{2}\right).$$

These curves must have stable slopes, and the stick force may not exceed 50 pounds, with—

(1) Wing flaps retracted;

(2) The most critical weight between the maximum landing weight and maximum takeoff weight;

(3) Power required for level flight at a speed equal to $V_{FC}-\left(\frac{V_{FC}-1.4\,V_{S_1}}{2}\right)$; and

(4) The airplane trimmed for level flight with the power required in subparagraph (3) of this paragraph.

(c) *Landing gear extended.* The stick force curve and, if required by § 25.123 (a), the elevator angle curve must have stable slopes at all speeds between 1.4 V_{S_1} and V_{LE}, and the stick force may not exceed 50 pounds with—

(1) Wing flaps retracted;

(2) The most critical weight between the maximum landing weight and maximum takeoff weight;

(3) Power required for level flight at V_{LE}; and

(4) The airplane trimmed for level flight with the power required in subparagraph (3) of this paragraph.

[Revision note: Based on § 4b.155]

§ 25.133 Dynamic longitudinal, directional, and lateral stability.

Any short period oscillation occurring between stalling speed and maximum allowable speed appropriate to the configuration of the airplane (for example, V_{FE}, V_{LE}, or V_{FC}/M_{FC}) must be heavily damped with the primary controls (1) free and (2) in a fixed position.

[Revision note: Combines §§ 4b.156 and 4b.158]

§ 25.135 Static directional and lateral stability.

(a) The static directional stability (as shown by the tendency to recover from a skid with the rudder free) must be positive with all landing gear and flap positions and symmetrical power conditions, at all speeds from 1.2 V_{S_1} up to V_{FE}, V_{LE}, or V_{FC}/M_{FC} (whichever is appropriate to the airplane configuration).

(b) The static lateral stability (as shown by the tendency to raise the low wing in a sideslip with the aileron controls free and with all landing gear and flap positions and symmetrical power conditions) must be positive at V_{FE}, V_{LE}, or V_{FC}/M_{FC} (whichever is appropriate to the airplane configuration) and may not be negative at a speed equal to 1.2 V_{S_1}.

(c) In straight, steady, sideslips (unaccelerated forward slips) the aileron and rudder control movements and forces must be substantially proportional to the angle of sideslip, and the factor of proportionality must lie between limits found necessary for safe operation throughout the range of sideslip angles appropriate to the operation of the airplane. At greater angles, up to the angle at which full rudder control is used or a rudder pedal force of 180 pounds is obtained, the rudder pedal forces may not reverse and increased rudder deflection must produce increased angles of sideslip. Unless the airplane has a yaw indicator, there must be enough bank accompanying sideslipping to clearly indicate any departure from steady unyawed flight.

[Revision note: Based on § 4b.157]

STALLING CHARACTERISTICS

§ 25.141 Stalls; symmetrical power.

(a) Stalls must be shown with the airplane in straight flight and in 30 degree banked turns with power off, and with the power necessary to maintain level flight at a speed of 1.6 V_{S_1} (where V_{S_1} corresponds to the stalling speed with flaps in the approach position, the landing gear retracted, and maximum landing weight). These stalls must be shown with—

(1) Wing flaps and landing gear in any likely combination of positions;

(2) Representative weights within the range for which certification is requested; and

(3) The center of gravity in the most adverse position for recovery.

(b) The stall demonstration must be conducted as follows:

(1) With the airplane trimmed for straight flight at the speed prescribed in § 25.37(c)(2)(i) for reciprocating engine powered airplanes, or in § 25.67(b)(1) for turbine engine powered airplanes, reduce the speed by means of the elevator control until it is steady at slightly above stalling speed. Apply elevator control at a rate that the speed reduction does not exceed one mile per hour per second until (i) the airplane is stalled, or (ii) the control reaches the stop.

(2) The airplane is considered stalled when, at an angle of attack measurably greater than that of maximum lift, the inherent flight characteristics give a clear indication to the pilot that the airplane is stalled. Typical indications of a stall are a nose-down pitch, or a roll, that cannot be readily arrested, or, if clear enough, a loss of control effectiveness, an abrupt change in control force or motion, characteristic buffeting, or a distinctive vibration of the pilot's controls. However, for airplanes with unmistakable inherent aerodynamic warning (such as buffeting, small amplitude pitch or roll oscillations, or distinctive shaking of the pilot's control) associated with the stall in all required configurations, the speed need not be reduced below a value providing an adequate stall warning margin as specified in § 25.145.

(3) After the airplane is stalled, recover by normal recovery techniques.

(c) During the stall demonstration, it must be possible to produce and to correct roll and yaw by unreversed use of the aileron and rudder controls, up to the moment the airplane is stalled. No abnormal nose-up pitching may occur. The longitudinal control force must be positive up to and throughout the stall.

(d) Straight flight stalls must be entered with wings level. The roll occurring between the stall and the completion of the recovery may not exceed approximately 20 degrees.

(e) In turning flight stalls, the action of the airplane after the stall may not be so violent or extreme as to make it difficult, with normal piloting skill, to effect a prompt recovery and to regain control of the airplane.

(f) In both the straight flight and the turning flight stall demonstrations, it must be possible to promptly prevent the airplane from stalling and to recover from the stall by normal use of the controls.

[Revision note: Based on § 4b.160]

§ 25.143 Stalls; Asymmetrical power.

(a) It must be possible to safely recover from a stall with the critical engine inoperative—

(1) Without applying power to the inoperative engine;

(2) With flaps and landing gear retracted; and

(3) With the remaining engines operating at up to 75 percent of maximum continuous power, or up to the power at which the wings can be held level laterally with the use of maximum control travel, whichever is less.

(b) The operating engines may be throttled back during stall recovery.

[Revision note: Based on § 4b.161]

§ 25.145 Stall warning.

(a) Stall warning with sufficient margin to prevent inadvertent stalling with the flaps and landing gear in all normal positions must be clear and distinctive to the pilot in straight and turning flight. The warning may be furnished either through the inherent aerodynamic qualities of the airplane or by a device that will give clearly distinguishable indications under all expected conditions of flight. A visual stall warning device that requires the attention of the crew within the cockpit is not acceptable by itself.

(b) A stall warning beginning at a speed of 7 percent above the stalling speed meets the requirements of this section. Lesser margins are acceptable if the stall warning has enough clarity, duration, distinctiveness, or other similar properties.

[Revision note: Combines §§ 4b.162 and last sentence of 4b.162–1]

§ 25.151 Longitudinal stability and control.

GROUP HANDLING CHARACTERISTICS

(a) There may be no uncontrollable tendency for landplanes to nose over in any reasonably expected operating condition or when rebound occurs during landing or takeoff. Wheel brakes must operate smoothly and may not induce any undue tendency to nose over.

(b) When a tail-wheel landing gear is used it must be possible, during the takeoff ground run on concrete, to maintain any attitude up to thrust line level, at 80 percent of V_{S_1}.

[Revision note: Based on § 4b.170]

§ 25.153 Directional stability and control.

(a) There may be no uncontrollable ground-looping tendency in 90° cross winds of velocity up to 0.2 V_{S_0} at any ground speed at which the airplane may be expected to be operated. This may be shown while establishing the cross wind component velocity required by § 25.157.

(b) Landplanes must be satisfactorily controllable, without exceptional piloting skill or alertness, in power-off landings at normal landing speed, without the use of brakes or engine power to maintain a straight path. This may be shown during power-off landings made in conjunction with other tests.

(c) The airplane must have adequate directional control during taxiing. This may be shown during taxiing prior to takeoffs made in conjunction with other tests.

[Revision note: Combines §§ 4b.171 and 4b.171–1]

§ 25.155 Shock absorption.

The shock absorbing mechanism may not damage the structure of the airplane when the airplane is taxied on the roughest ground that it is reasonable to expect the airplane to encounter in normal operation.

[Revision note: Based on § 4b.172]

§ 25.157 Demonstrated crosswind component.

A cross component of wind velocity, that is shown to be safe for takeoff or landing, must be established.

[Revision note: Based on § 4b.173]

WATER HANDLING CHARACTERISTICS

§ 25.161 Water conditions.

The most adverse water conditions, in which the seaplane or amphibian is shown to be safe for takeoff, taxiing, and landing, must be established.

[Revision note: Based on § 4b.180]

§ 25.163 Wind conditions.

The following wind velocities must be established:

(a) A lateral component of wind velocity, not less than 0.2 V_{S_0}, at and below which it is shown that the seaplane or amphibian is safe for takeoff and landing under all water conditions in which it is likely to be operated.

(b) A wind velocity at and below which it is shown that the seaplane or amphibian is safe for taxing in all directions under all water conditions in which it is likely to be operated.

[Revision note: Based on § 4b.181]

§ 25.165 Control and stability on the water.

(a) During takeoff, taxiing, and landing, and in the conditions set forth in paragraph (b) of this section, the seaplane or amphibian may not show—

(1) Any dangerous uncontrollable porpoising, bouncing, or swinging tendency;

(2) Any submerging of auxiliary floats or sponsons, any immersion of wing tips, propeller blades, or other parts that are not designed to withstand the resulting water loads; and

(3) Any spray forming that would impair the pilot's view, cause damage, or result in the taking in of an undue quantity of water.

(b) Compliance with the requirements of paragraph (a) of this section must be shown—

(1) In water conditions, from smooth to the most adverse condition established in accordance with § 25.161;

(2) In wind and cross-wind velocities, water currents, and associated waves and swells that the seaplane or amphibian is likely to encounter in operation on water;

(3) At speeds at which the seaplane or amphibian is likely to be operated on the water;

(4) With sudden failure of the critical engine occurring at any time the seaplane or amphibian is operated on water; and

(5) At all seaplane or amphibian weights and center of gravity positions, within the range of loading conditions for which certification is requested, relevant to each condition of operation.

(c) In the water conditions of paragraph (b) of this section, and in the corresponding wind conditions, the seaplane or amphibian must be able to drift for five minutes with engines inoperative, aided, if necessary, by a sea anchor.

[Revision note: Based on § 4b.182]

MISCELLANEOUS FLIGHT REQUIREMENTS

§ 25.171 Vibration and buffeting.

(a) All parts of the airplane must be shown in flight to be free from excessive vibration, under all speed and power conditions appropriate to the operation of the airplane, up to at least the minimum value allowed for V_D in § 25.203(e). The maximum speeds shown must be used in establishing the operating limitations of the airplane in accordance with § 25.1153.

(b) There may be no buffeting condition, in normal flight, severe enough to interfere with the control of the airplane, to cause excessive fatigue to the crew, or to cause structural damage. Stall warning buffeting within these limits is allowable.

[Revision note: Based on § 4b.190]

§ 25.173 High-speed characteristics.

(a) *Speed increase and recovery characteristics.* The following speed increase and recovery characteristics must be met:

(1) Operating conditions or characteristics likely to cause inadvertent speed increases (including upsets in pitch and roll) must be simulated with the airplane trimmed at any likely cruise speed up to V_{MO}/M_{MO}. Examples of operating conditions or characteristics likely to cause speed increases are gust upsets, inadvertent control movements, low stick force gradient in relation to control friction, passenger movement, leveling off from climb, and descent from Mach to airspeed limit altitudes. Allowing for pilot reaction time after effective inherent or artificial speed warning occurs, it must be shown that the airplane can be recovered to a normal attitude and its speed reduced to V_{MO}/M_{MO}, without requiring exceptional pilot strength or skill, without exceeding V_D/M_D, V_{DF}/M_{DF}, or the structural limitations, and without buffeting that would cause structural damage.

(2) There may be no reversal of airplane response to pilot control movement about any axis at any speed up to V_{DF}/M_{DF}. Any reversal of elevator control force or tendency of the airplane to pitch, roll, or yaw must be mild and readily controllable using normal piloting techniques.

(b) *Maximum speed for stability characteristics, V_{FC}/M_{FC}.* V_{FC}/M_{FC} is the maximum speed at which the requirements of §§ 25.105(e), 25.131 (a), 25.133, and 25.135 (a) and (b) must be met with flaps and landing gear retracted. It may not be less than a speed midway between V_{MO}/M_{MO} and V_{DF}/M_{DF}, except that, in the altitude range where Mach number is the limiting factor, M_{FC} need not exceed the Mach number at which effective speed warning occurs.

[Revision note: Based on § 4b.191]

Subpart C—Strength Requirements

GENERAL

§ 25.191 Loads.

(a) Strength requirements are specified in terms of limit loads, which are the maximum loads to be expected in service, and ultimate loads, which are limit loads multiplied by prescribed factors of safety. Unless otherwise specified, all prescribed loads are limit loads.

(b) Unless otherwise provided, the specified air, ground, and water loads must be placed in equilibrium with inertia forces, considering all items of mass in the airplane. All these loads must be distributed in a manner conservatively approximating or closely representing actual conditions. If deflections under load would significantly change the distribution of external or internal loads, this redistribution must be taken into account.

[Revision note: Based on §§ 4b.200 (less (a))]

§ 25.193 Factor of safety.

Unless otherwise specified in this part, a factor of safety of 1.5 must be used.

[Revision note: Based on § 4b.200(a)]

§ 25.195 Strength and deformation.

(a) The structure must be able to support limit loads without detrimental permanent deformations. At all loads up to limit loads, the deformation may not interfere with safe operation.

(b) The structure must be able to support ultimate loads without failure for at least three seconds. However, when proof of strength is shown by dynamic tests simulating actual load conditions, the three second limit does not apply.

(c) Where structural flexibility is of a degree that any rate of load application likely to occur in the operating conditions might produce transient stresses appreciably higher than those corresponding to static loads, the effects of this rate of application must be considered.

[Revision note: Based on § 4b.201]

§ 25.197 Proof of structure.

(a) Proof of compliance of the structure with the strength and deformation requirements of § 25.195 must be made for all critical loading conditions. Proof of compliance by means of structural analysis is acceptable only if the structure conforms to types for which experience has shown this method to be reliable. In all other cases, substantiating load tests are required. Certain portions of the structure must be tested as specified in § 25.391.

(b) Proof of compliance of the structure with the fatigue evaluation requirements of § 25.341 must be made.

[Revision note: Based on § 4b.202]

FLIGHT LOADS

§ 25.201 Flight loads; general.

(a) Flight load factors represent the ratio of the aerodynamic force component (acting normal to the assumed longitudinal axis of the airplane) to the weight of the airplane. A positive load factor denotes an aerodynamic force acting upward with respect to the airplane.

(b) Considering compressibility effects at all speeds, the airplane must conform to the flight load requirements in this part—

(1) At critical altitudes within the range of altitudes selected by the applicant;

(2) At all weights between the design minimum weight and the design maximum weight; and

(3) With any practicable distribution of disposable load within the operating limitations recorded in the Airplane Flight Manual.

[Revision note: Based on § 4b.210 (less (b) and (c))]

§ 25.203 Design airspeeds.

The selected design airspeeds are equivalent airspeeds (EAS) and may not be less than the speeds set forth in this section. Estimated values of the speeds V_{S_0} and V_{S_1} must be conservative.

(a) *Design flap speeds, V_F.* The design flap speed for each flap position (established in accordance with § 25.437 (a)) must be sufficiently greater than the operating speed recommended for the corresponding stage of flight (including balked landings) to allow for probable variations in control of airspeed and for transition from one flap position to another. If an automatic flap positioning or load limiting device is used, the speeds and corresponding flap positions programmed or allowed by the device may be used. V_F may not be less than—

(1) 1.6 V_{S_1} with the flaps in takeoff position at maximum takeoff weight;

(2) 1.8 V_{S_1} with the flaps in approach position at maximum landing weight; and

(3) 1.8 V_{S_0} with the flaps in landing position at maximum landing weight.

(b) *Design maneuvering speed V_A.* (1) The design maneuvering speed V_A is equal to $V_{S_1}\sqrt{n}$ where—

(i) n is the limit positive maneuvering load factor at V_C; and

(ii) V_{S_1} is the stalling speed with flaps retracted.

(2) V_A and V_S must be evaluated at the design weight and altitude under consideration. V_A need not be greater than V_C or the speed at which the positive $C_{N\ max}$ curve intersects the positive maneuver load factor line, whichever is less.

(c) *Design speed for maximum gust intensity, V_B.* (1) V_B must be either the speed determined by the intersection of the line representing the maximum positive lift $C_{N\ max}$ and the line representing the rough air gust velocity on the gust V-n diagram, or $(\sqrt{n_g})\ V_{S_1}$, whichever is less where—

(i) n_g is the positive airplane gust load factor due to gust, at speed V_C (in accordance with § 25.211), and at the particular weight under consideration; and

(ii) V_{S_1} is the stalling speed with the flaps retracted at the particular weight under consideration.

(2) V_B need not be greater than V_C.

(d) *Design cruising speed, V_C.* The minimum design cruising speed V_C must be sufficiently greater than V_B to provide for inadvertent speed increases likely to occur as a result of severe atmospheric turbulence. In the absence of a rational investigation substantiating the use of other values, V_C may not be less than V_B+50 (m.p.h.). However, it need not exceed the maximum speed in level flight at maximum continuous power for the corresponding altitude. At altitudes where V_D is limited by Mach number, V_C may be limited to a selected Mach number.

(e) *Design dive speed, V_D.* The selected design dive speed must be used in determining the maximum operating limit speed for the airplane in accordance with § 25.1153.

[Revision note: Based on § 4b.210(b)]

§ 25.205 Design fuel and oil loads.

(a) The disposable load combinations must include all fuel and oil loads in the range from zero fuel and oil to the selected maximum fuel and oil loads. A structural reserve fuel condition, not exceeding 45 minutes of fuel under operating conditions defined in § 25.733(c), may be selected.

(b) If a structural reserve fuel condition is selected, it must be used as the minimum fuel weight condition for showing compliance with the flight load requirements as prescribed in this subpart. In addition—

(1) The structure must be designed for a condition of zero fuel and oil in the wing at limit loads corresponding to—

(i) A maneuvering load factor of +2.25; and

(ii) Gust intensities equal to 85 percent of the values prescribed in § 25.211;

(2) Fatigue evaluation of the structure must account for any increase in operating stresses resulting from the design condition of subparagraph (b)(1) of this paragraph; and

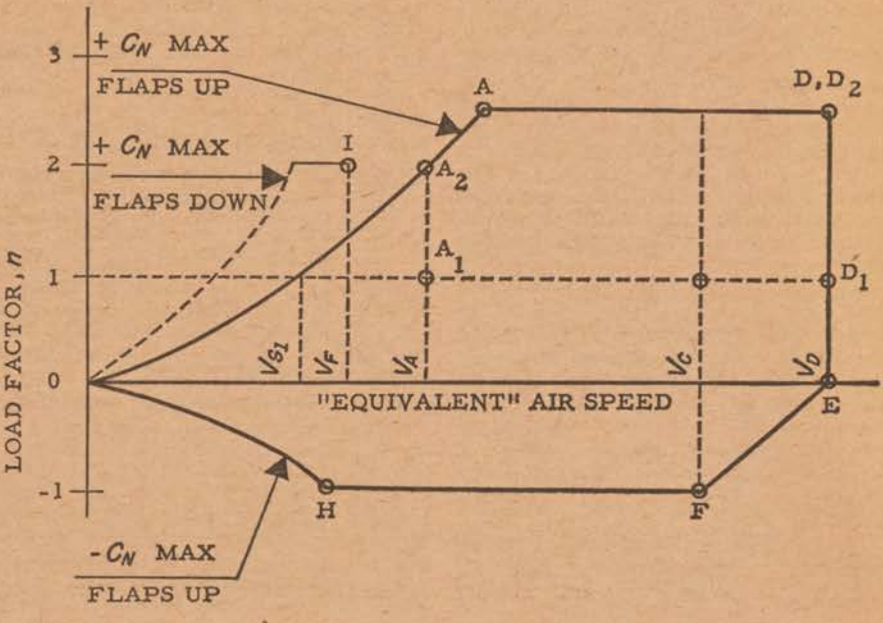
(3) The flutter, deformation, and vibration requirements must also be met with zero fuel.

[Revision note: Based on § 4b.210(c)]

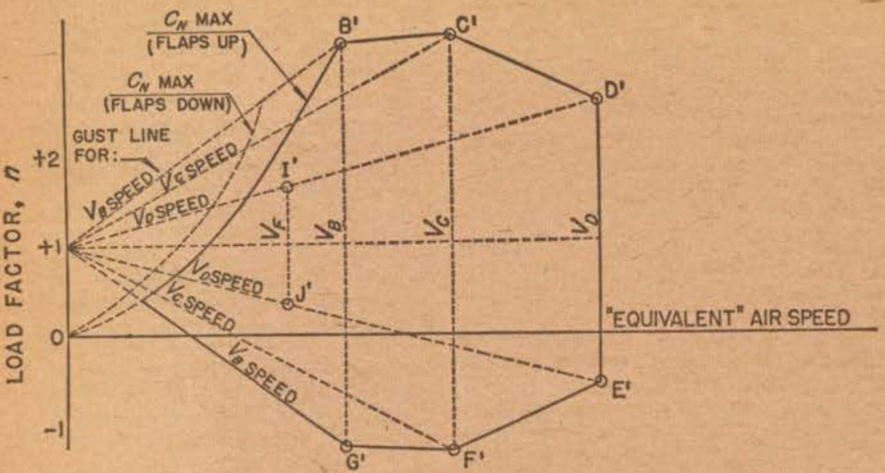
§ 25.207 Flight envelope.

(a) The strength requirements must be met at all combinations of airspeed and load factor on and within the boundaries of the representative maneuvering and gust envelopes (V–n diagrams) of paragraphs (b) and (c) of this section. These envelopes must also be used in determining the airplane structural operating limitations as specified in § 25.1151.

(b) Maneuvering envelope.



(c) Gust envelope.



[Revision note: Combines §§ 4b.211 (less (a) and (b)) and figures 4b-2 and 4b-3)]

§ 25.209 Maneuvering load factors.

Except where limited by maximum (static) lift coefficients, the airplane is assumed to be subjected to symmetrical maneuvers resulting in the limit load factors prescribed in paragraphs (a) and (b) of this section. Pitching velocities appropriate to the corresponding pull-up and steady turn maneuvers must be taken into account. Lower values of maneuvering load factor may be used if it is shown that the airplane embodies features that make it impossible to exceed these lower values in flight.

(a) The selected positive maneuvering load factor n for any flight speed up to V_D may not be less than 2.5.

(b) The negative maneuvering load factor must have a minimum value of −1.0 at all speeds up to V_C, and must vary linearly with speed from the value at V_C to zero at V_D.

[Revision note: Based on § 4b.211(a)]

§ 25.211 Gust load factors.

(a) The airplane is assumed to be subjected to symmetrical vertical gusts while in level flight. The resulting limit load factors must correspond to the following conditions:

(1) Positive (up) and negative (down) rough air gusts of 66 fps at the speed V_B must be considered at altitudes between sea level and 20,000 feet. At altitudes above 20,000 feet, the gust velocity may be reduced linearly from 66 fps at 20,000 feet to 38 fps at 50,000 feet.

(2) Positive and negative gusts of 50 fps at the speed V_C must be considered at altitudes between sea level and 20,000 feet. At altitudes above 20,000 feet, the gust velocity may be reduced linearly from 50 fps at 20,000 feet to 25 fps at 50,000 feet.

(3) Positive and negative gusts of 25 fps at the speed V_D must be considered at altitudes between sea level and 20,000 feet. At altitudes above 20,000 feet, the gust velocity may be reduced linearly from 25 fps at 20,000 feet to 12.5 fps at 50,000 feet.

(b) The following assumptions must be made:

(1) The shape of the gust is

$$U=\frac{U_{de}}{2}\left(1-\cos\frac{2\pi s}{25\overline{C}}\right)$$

where—

s=distance penetrated into gust (ft);
$\overline{C}$=mean geometric chord of wing (ft); and
U_{de}=derived gust velocity referred to in paragraph (a) (fps).

(2) Gust load factors vary linearly between the specified conditions B′ through G′, as shown on the gust envelope in § 25.207(c).

(c) In the absence of a more rational analysis, the gust load factors must be computed as follows:

$$n=1+\frac{K_g U_{de} Va}{498\,(W/S)}$$

where—

$K_g=\frac{0.88\mu_g}{5.3+\mu_g}$=gust alleviation factor;
$\mu_g=\frac{2(W/S)}{\rho\overline{C}ag}$=airplane mass ratio;
U_{de}=derived gust velocities referred to in paragraph (a) (fps);
ρ=density of air (slugs/cu. ft.);
W/S=wing loading (psf);
$\overline{C}$=mean geometric chord (ft.);
g=acceleration due to gravity (ft/sec.^{2});
V=airplane equivalent speed (knots); and
a=slope of the airplane normal force coefficient curve C_{N_A} per radian if the gust loads are applied to the wings and horizontal tail surfaces simultaneously by a rational method. The wing lift curve slope C_L per radian may be used when the gust load is applied to the wings only and the horizontal tail gust loads are treated as a separate condition.

[Revision note: Based on § 4b.211(b)]

§ 25.213 Effect of high lift devices.

(a) If flaps are to be used during takeoff, approach, or landing, at the design flap speeds established for these stages of flight under § 25.203(a) and with the flaps in the corresponding positions, the airplane is assumed to be subjected to symmetrical maneuvers and gusts within the range determined by—

(1) Maneuvering to a positive limit load factor of 2.0; and

(2) Positive and negative 25 fps derived gusts acting normal to the flight path in level flight.

(b) If flaps or similar high lift devices are to be used as speed brakes in en route conditions, and with flaps in the appropriate position at speeds up to the flap design speed chosen for these conditions, resulting in limit load factors, the airplane is assumed to be subjected to symmetrical maneuvers and gusts within the range determined by—

(1) Maneuvering to a positive limit load factor of 2.5; and

(2) Positive and negative derived gusts as prescribed in § 25.211 acting normal to the flight path in level flight.

(c) The airplane must be designed for the conditions prescribed in paragraph (a) of this section, except that the airplane load factor need not exceed 1.0, taking into account, as separate conditions, the effects of—

(1) Propeller slipstream corresponding to maximum continuous power at the design flap speeds V_F, and with takeoff power at not less than 1.4 times the stalling speed for the particular flap position and associated maximum weight; and

(2) A head-on gust of 25 feet per second velocity (EAS).

[Revision note: Based on § 4b.212]

§ 25.215 Symmetrical flight condition.

(a) *Procedure.* The analysis of symmetrical flight must include at least the conditions specified in paragraphs (b), (c), and (d) of this section. The following procedure must be used for analysis:

(1) Enough points on the maneuvering and gust envelopes must be investigated to insure that the maximum load for each part of the airplane structure is obtained. A conservative combined envelope may be used for this purpose.

(2) All significant forces acting on the airplane must be placed in equilibrium in a rational or conservative manner. The linear inertia forces must be considered to be in equilibrium with wing and horizontal tail surface loads, while the angular (pitching) inertia forces must be considered to be in equilibrium with wing and fuselage aerodynamic moments and horizontal tail surface loads.

(3) Where sudden displacement of a control is specified, the assumed rate of displacement need not exceed the rate that could be applied by the pilot.

(4) In determining elevator angles and chordwise load distribution (in the maneuvering conditions of paragraphs (b) and (c) of this section) in turns and pullups, the effect of corresponding pitching velocities must be taken into account.

(b) *Maneuvering balanced conditions.* Assuming the airplane to be in equilibrium with zero pitching acceleration, the maneuvering conditions A through I on the maneuvering envelope in § 25.207(b) must be investigated.

(c) *Maneuvering pitching conditions.* The following conditions involving pitching acceleration must be investigated:

(1) *Maximum elevator displacement at speed V_A.* The airplane is assumed to be flying in steady level flight (point A_1, § 25.207(b)) and, except as limited by pilot effort in accordance with § 25.241 (a), the pitching control is suddenly moved to obtain extreme positive pitching (nose up).

(2) *Checked maneuver at speed between V_A and V_D.* The airplane is assumed to be subjected to a checked maneuver from steady level flight, (points A_1 to D_1, § 25.207(b)) and from the positive load factor (points A_2 to D_2, § 25.207(b)) as follows:

(i) Unless it is shown that lesser values could not be exceeded, a positive acceleration (nose up) is assumed to be reached concurrently with the airplane load factor of unity (points A_1 to D_1, § 25.207(b)). This positive acceleration must be equal to at least $\frac{39}{V}n\ (n-1.5)$ (radians/sec.²), where—

(*a*) n is the positive load factor at the speed under consideration; and

(*b*) V is the airplane equivalent speed in knots.

(ii) Unless it is shown that lesser values could not be exceeded, a negative pitching acceleration (nose down) is assumed to be reached concurrently with the airplane positive maneuvering load factor (points A_2 to D_2, § 25.207 (b)). This negative pitching acceleration must be equal to at least

$$-\frac{26}{V}n\ (n-1.5)\ \text{(radians/sec.}^2\text{)}$$

where—

(*a*) n is the positive load factor at the speed under consideration; and

(*b*) V is the airplane equivalent speed in knots.

(3) *Specified control displacement.* Instead of the conditions set forth in subparagraph (2) of this paragraph, a checked maneuver, based on a rational pitching control motion vs. time profile may be established in which the design limit load factor as defined in § 25.209(a) will not be exceeded. Unless it is shown that lesser values cannot be exceeded, the airplane response must result in pitching accelerations not less than those specified in subparagraph (2).

(d) *Gust conditions.* The gust conditions B′ through J′, § 25.207(c), must be investigated. The following provisions apply:

(1) The air load increment due to a specified gust must be added to the initial balancing tail load corresponding to steady level flight.

(2) The alleviating effect of wing down-wash and of the airplane's motion in response to the gust may be included in computing the tail gust load increment.

(3) Instead of a rational investigation of the airplane response, the gust alleviation factor K_g may be applied to the specified gust intensity for the horizontal tail.

[Revision note: Based on § 4b.213]

§ 25.217 Rolling conditions.

The airplane must be designed for rolling loads resulting from the conditions specified in paragraphs (a) and (b) of this section. Unbalanced aerodynamic moments about the center of gravity must be reacted in a rational or conservative manner considering the principal masses furnishing the reacting inertia forces.

(a) *Maneuvering.* The following conditions, speeds, and aileron deflections (except as the deflections may be limited by pilot effort) must be considered in combination with an airplane load factor of zero and of two-thirds of the positive maneuvering factor used in the design of the airplane. In determining the required aileron deflections, the torsional flexibility of the wing must be considered in accordance with § 25.191 (b):

(1) Conditions corresponding to steady rolling velocity must be investigated. In addition, conditions corresponding to maximum angular acceleration must be investigated for airplanes with engines or other weight concentrations outboard of the fuselage. For the angular acceleration conditions, zero rolling velocity may be assumed in the absence of a rational time history investigation of the maneuver.

(2) At speed V_A, a sudden deflection of the aileron to the stop is assumed.

(3) At speed V_C, the aileron deflection must be that required to produce a rate of roll not less than that obtained in condition (2) of this paragraph.

(4) At speed V_D, the aileron deflection must be that required to produce a rate of roll not less than one-third of that in condition (2) of this paragraph.

(b) *Unsymmetrical gusts.* The condition of unsymmetrical gusts must be considered by modifying the symmetrical flight conditions B′ or C′ (see § 25.207 (c)) whichever produces the greater load factor. It is assumed that 100 percent of the wing air load acts on one side of the airplane and 80 percent acts on the other side.

[Revision note: Based on § 4b.214]

§ 25.219 Yawing conditions.

The airplane must be designed for loads resulting from the conditions specified in paragraphs (a) and (b) of this section. Unbalanced aerodynamic moments about the center of gravity must be reacted in a rational or conservative manner considering the principal masses furnishing the reacting inertia forces:

(a) *Maneuvering.* At all speeds from V_{MC} to V_A, the following maneuvers must be considered. In computing the tail loads, the yawing velocity may be assumed to be zero:

(1) With the airplane in unaccelerated flight at zero yaw, it is assumed that the rudder control is suddenly displaced to the maximum deflection, as limited by the control stops or by a 300 lb. rudder pedal force, whichever is critical.

(2) With the rudder deflected as specified in subparagraph (1) of this paragraph, it is assumed that the airplane yaws to the resulting sideslip angle.

(3) With the airplane yawed to the static sideslip angle corresponding to the rudder deflection specified in subparagraph (1) of this paragraph, it is assumed that the rudder is returned to neutral.

(b) *Lateral gusts.* The airplane is assumed to encounter derived gusts normal to the plane of symmetry while in unaccelerated flight. The derived gusts and airplane speeds corresponding to conditions B′ through J′ (see § 25.207 (c)) (as determined by §§ 25.211 and 25.213(a)(2) or § 25.213(b)(2)) must be investigated. The shape of the gust must be the same as specified in § 25.211. In the absence of a rational investigation of the airplane's response to a gust, the gust loading on the vertical tail surfaces must be computed using the following formula:

$$L_t=\frac{K_{g_t}U_{de}V_{a_t}S_t}{498}$$

where—

L_t=vertical tail load (lbs.);

$K_{g_t}=\frac{0.88\mu_{g_t}}{5.3+\mu_{g_t}}$=gust alleviation factor;

$\mu_{g_t}=\frac{2W}{\rho\overline{C}_t g a_t S_t}\left(\frac{K}{l_t}\right)^2$=lateral mass ratio;

U_{de}=derived gust velocity (fps);

ρ=air density (slugs/cu. ft.);

W=airplane weight (lbs.);

S_t=area of vertical tail (ft.²);

$\overline{C}_t$=mean geometric chord of vertical surface (ft.);

a_t=lift curve slope of vertical tail (per radian);

K=radius of gyration in yaw (ft.);

l_t=distance from airplane c.g. to lift center of vertical surface (ft.);

g=acceleration due to gravity (ft./sec.²); and

V=airplane equivalent speed (knots).

[Revision note: Based on § 4b.215]

SUPPLEMENTARY FLIGHT CONDITIONS

§ 25.221 Engine torque effects.

(a) Engine mounts and their supporting structures must be designed for engine torque effects combined with—

(1) The limit torque corresponding to takeoff power and propeller speed acting simultaneously with 75 percent of the limit loads from flight condition A;

(2) The limit torque corresponding to maximum continuous power and propeller speed acting simultaneously with the limit loads from flight condition A; and

(3) For turbine propeller installations, in addition to the conditions specified in subparagraphs (1) and (2) of this paragraph, the limit torque corresponding to takeoff power and propeller speed multiplied by a factor of 1.6 acting simultaneously with 1g level flight loads.

(b) For turbine engine installations, the limit torque load imposed by sudden engine stoppage due to malfunction or structural failure (such as compressor jam-up) must considered in the design of the engine mounts and supporting structure.

(c) The limit torque is obtained by multiplying the mean torque by a factor of 1.33 for reciprocating engines with 5 or more cylinders or by factors of 2, 3, or 4 for engines with 4, 3, or 2 cylinders, respectively. For turbo propeller installations, the limit torque is obtained by multiplying the mean torque by a factor of 1.25.

[Revision note: Based on § 4b.216 (less (b)–(e)]

§ 25.223 Side load on engine mount.

The limit load factor in a lateral direction for the side load on the engine mount must be equal to the maximum load factor obtained in the yawing conditions, but may not be less than either 1.33, or one-third the limit load factor for flight condition A. Each engine mount and its supporting structure must be designed for this condition, which may be assumed to be independent of other flight conditions.

[Revision note: Based on § 4b.216(b)]

§ 25.225 Pressurized cabin loads.

For pressurized compartments for the occupants of the airplane, the following requirements must be met:

(a) The airplane structure must have sufficient strength to withstand the flight loads combined with pressure differential loads from zero up to the maximum relief valve setting. The external pressure distribution in flight must be accounted for. Stress concentration and fatigue effects must be considered in the design of a pressure cabin.

(b) If landings may be made with the cabin pressurized, landing loads must be combined with pressure differential loads from zero up to the maximum allowed during landing.

(c) The airplane structure must have sufficient strength to withstand the pressure differential loads corresponding to the maximum relief valve setting multiplied by a factor of 1.33. All other loads may be omitted in this case.

(d) If a pressurized cabin is separated into two or more compartments by partitions, bulkheads, or floors, the structure supporting the prescribed flight and ground loads (and any other structure that, if it failed, could interfere with the continued safe flight and landing of the airplane) must be designed to withstand the effects of sudden release of pressure in any compartment through an opening resulting from the failure or penetration of an external door, window, or windshield panel, or from structural fatigue or penetration of the fuselage in this compartment, unless it is shown that the probability of failure or penetration is extremely remote. In determining the probability of failure or penetration and probable size of openings, the fail-safe features of the design may be considered if possible improper operation of closure devices and inadvertent door openings are also considered. The pressure relief provided by intercompartment venting may also be considered. As parts of the airplane other than the structure specified in this paragraph may be damaged, reasonable design precautions must be taken to minimize the probability of parts becoming detached and injuring occupants while in their seats.

[Revision note: Based on § 4b.216(c)]

§ 25.227 Unsymmetrical loads due to engine failure.

(a) The airplane must be designed for the unsymmetrical loads resulting from the failure of the critical engine. Turbopropeller airplanes must be designed for the conditions prescribed in subparagraphs (1) through (4) of this paragraph in combination with a single malfunction of the propeller drag limiting system, considering the probable pilot corrective action on the flight controls.

(1) At all speeds between V_{MO} and V_D, the loads resulting from engine power failure because of fuel flow interruption are considered to be limit loads.

(2) At all speeds between V_{MO} and V_C, the loads resulting from the disconnection of the engine compressor from the turbine or from loss of the turbine blades are considered to be ultimate loads.

(3) The time history of the thrust decay and drag build-up occurring as a result of the prescribed engine failures must be substantiated by test or other data applicable to the particular engine-propeller combination.

(4) The timing and magnitude of the probable pilot corrective action must be conservatively estimated, considering the characteristics of the particular engine-propeller-airplane combination.

(b) Pilot corrective action may be assumed to be initiated at the time maximum yawing velocity is reached, but not earlier than two seconds after the engine failure. The magnitude of the corrective action may be based on the control forces specified in § 25.241(a) except that lower forces may be assumed where it is shown by analysis or test that these forces will be sufficient to control the yaw and roll resulting from the prescribed engine failure conditions.

[Revision note: Based on § 4b.216(d)]

§ 25.229 Gyroscopic loads.

The structure supporting the engines must be designed for gyroscopic loads associated with the conditions specified in §§ 25.215, 25.217, and 25.219, with the engines operating at maximum continuous rpm.

[Revision note: Based on § 4b.216(e)]

§ 25.231 Speed control devices.

If speed control devices (such as spoilers and drag flaps) are installed for use in en route conditions, the following requirements must be met:

(a) The airplane must be designed for the symmetrical maneuvers and gusts prescribed in §§ 25.207, 25.209, and 25.211, and the yawing maneuvers and lateral gusts in § 25.219, with the device extended at all speeds up to the placard device extended speed.

(b) If the speed control device has automatic operation or load limiting features, the airplane must be designed for the maneuver and gust conditions prescribed in paragraph (a) of this section, at the speeds and corresponding device positions that the mechanism allows.

[Revision note: Based on § 4b.217]

CONTROL SURFACE AND SYSTEM LOADS

§ 25.241 Control surface loads; general.

The control surfaces must be designed for the limit loads resulting from the flight conditions in §§ 25.215 through 25.219 and the ground gust conditions in § 25.253, considering the following:

(a) *Effect of pilot effort.* In the control surface flight loading condition, the air loads on the movable surfaces and the corresponding deflections need not exceed those that could be obtained in flight by using the maximum pilot control forces specified in § 25.255(b). Two-thirds of the maximum values specified for the aileron and elevator may be used if control surface hinge moments are based on reliable data. In applying this criterion, the effects of servo mechanisms, tabs, and automatic pilot systems, in assisting the pilot must be considered.

(b) *Effect of trim tabs.* The effect of trim tabs on the main control surface design conditions must be accounted for only in cases where the surface loads are limited by pilot effort in accordance with the provisions of paragraph (a) of this section. In these cases, the trim tabs are considered to be deflected in the direction that would assist the pilot, and the deflections are—

(1) For elevator trim tabs, those required to trim the airplane at any point within the positive portion of the *V–n* diagram in § 25.207(b), except as limited by the stops; and

(2) For aileron and rudder trim tabs, those required to trim the airplane in the critical unsymmetrical power and loading conditions, with appropriate allowance for rigging tolerances.

(c) *Unsymmetrical loads.* Horizontal tail surfaces and the supporting structure must be designed for unsymmetrical loads arising from yawing and slipstream effects, in combination with the prescribed flight conditions. In the absence of more rational data, the following assumption may be made:

(1) For airplanes that are conventional in regard to location of propellers, wings, tail surfaces and fuselage shape—

(i) 100 percent of the maximum loading from the symmetrical flight conditions acts on the surface on one side of the plane of symmetry; and

(ii) 80 percent of this loading acts on the other side.

(2) For airplanes that are not conventional (such as where the horizontal tail surfaces have appreciable dihedral or are supported by the vertical tail surfaces), the surfaces and supporting structures may be designed for combined vertical and horizontal surface loads resulting from the prescribed maneuvers.

(d) *Outboard fins.* (1) If outboard fins are carried on the horizontal tail surface, the tail surfaces must be designed for the maximum horizontal surface load in combination with the corresponding loads induced on the vertical surfaces by end plate effects. These induced effects need not be combined with other vertical surface loads.

(2) To provide for unsymmetrical loading when outboard fins extend above and below the horizontal surface, the critical vertical surface loading (load per unit area) determined by the provisions of this section must also be applied as follows:

(i) 100 percent to the area of the vertical surfaces above (or below) the horizontal surface.

(ii) 80 percent to the area below (or above) the horizontal surface.

(e) *Loads parallel to hinge line.* Control surfaces and supporting hinge brackets must be designed for inertia loads acting parallel to the hinge line. In the absence of more rational data, the inertia loads may be assumed to be equal to KW, where—

(1) K=24 for vertical surfaces;
(2) K=12 for horizontal surfaces; and
(3) W=weight of the movable surfaces.

[Revision note: Based on § 4b.220]

§ 25.243 Wing flaps.

Wing flaps and their supporting structure and operating mechanism must be designed for the critical loads resulting from the conditions prescribed in § 25.213, accounting for the loads occurring during transition from one flap position and airspeed to another.

[Revision note: Based on § 4b.221]

§ 25.245 Tabs.

(a) *Trim tabs.* Trim tabs must be designed to withstand loads arising from all likely combinations of tab setting, primary control position, and airplane speed (obtainable without exceeding the flight load conditions prescribed for the airplane as a whole), when the effect of the tab is being opposed by pilot effort loads up to those specified in § 25.241(a).

(b) *Balancing tabs.* Balancing tabs must be designed for deflections consistent with the primary control surface loading conditions.

(c) *Servo tabs.* Servo tabs must be designed for all deflections consistent with the primary control surface loading conditions obtainable within the pilot maneuvering effort and considering possible opposition from the trim tabs.

[Revision note: Based on § 4b.222]

§ 25.247 Special devices.

The loading for special devices using aerodynamic surfaces (such as slots and spoilers) must be determined from test data.

[Revision note: Based on § 4b.223]

§ 25.249 Primary flight control systems.

(a) Elevator, aileron, and rudder control systems and their supporting structures must be designed for loads corresponding to 125 percent of the computed hinge moments of the movable control surface in the conditions prescribed in § 25.241.

(b) The system limit loads, except the loads resulting from ground gusts, need not exceed the loads that can be produced by the pilot (or pilots) and by automatic devices operating the controls. The loads must be sufficient to provide a rugged system for service use, considering jamming, ground gusts, taxiing tail to wind, control inertia, and friction.

[Revision note: Based on § 4b.224 (less last two sentences of paragraph (a))]

§ 25.251 Dual primary flight control systems.

If there are dual controls, the system must be designed for the pilots operating in opposition, using individual pilot loads equal to 75 percent of those obtained in accordance with § 25.249. However, the individual pilot loads may not be less than the minimum loads specified in § 25.255(b). In addition, the control system must be designed for the pilots acting in conjunction, using individual pilot loads equal to 75 percent of those obtained in accordance with § 25.249.

[Revision note: Based on § 4b.225]

§ 25.253 Ground gust conditions.

The following conditions (simulating the loadings on control surface due to ground gusts and taxiing downwind) must be investigated:

(a) The control system between the stops nearest the surfaces and the cockpit controls must be designed for loads corresponding to the limit hinge moments H of paragraph (b) of this section. However, these loads need not exceed the loads corresponding to the maximum pilot loads in § 25.255(b) for each pilot alone, or to 75 percent of these maximum loads for each pilot when the pilots act in conjunction.

(b) The control system stops nearest the surfaces, the control system locks, and the parts of the systems (if any) between these stops and locks and the control surface horns, must be designed for limit hinge moments H obtained from the formula, $H=KcSq$ where—

(1) H=limit hinge moment (ft. lbs.);
(2) c=mean chord of the control surface aft of the hinge line (ft.);
(3) S=area of the control surface aft of the hinge line (sq. ft.);
(4) q=dynamic pressure (p.s.f.) based on a design speed not less than 10 $\sqrt{W/S}+10$ (m.p.h.), except that the design speed need not exceed 60 m.p.h.; and
(5) K=limit hinge moment factor for ground gusts and is derived as follows:

Surface	K	Position of controls
(a) Aileron	0.75	Control column locked or lashed in mid-position.
(b) Aileron	*±0.50	Ailerons at full throw.
(c) (d) Elevator	*±0.75	(c) Elevator full down.
		(d) Elevator full up.
(e) (f) Rudder	0.75	(e) Rudder in neutral.
		(f) Rudder at full throw.

*A positive value of K indicates a moment tending to depress the surface, while a negative value of K indicates a moment tending to raise the surface.

[Revision note: Combines §§ 4b.226 and figure 4b–4]

§ 25.255 Pilot control force limits (primary controls).

(a) The maximum and minimum pilot loads for elevator, aileron, and rudder, controls are specified in paragraph (b) of this section. These pilot loads are assumed to act at the appropriate control grips or pads (in a manner simulating flight conditions) and to be reacted at the attachment of the control system to the control surface horn.

(b) This table sets forth limit pilot loads for one pilot:

Control	Maximum load	Minimum load
Aileron:		
Stick	100 lbs.	40 lbs.
Wheel*	80 D in.-lbs.**	40 D in.-lbs.
Elevator:		
Stick	250 lbs.	100 lbs.
Wheel	300 lbs.	100 lbs.
Rudder	300 lbs.	130 lbs.

*The critical portions of the aileron control system must be designed for a single tangential force with a limit value equal to 1.25 times the couple force determined from these criteria.

**D=wheel diameter (inches).

[Revision note: Combines last two sentences of § 4b.224(a) and table 4b–5]

§ 25.257 Secondary control systems.

Secondary controls (such as wheel brake, spoiler, and tab controls) must be designed for the maximum loads that a pilot is likely to apply to the particular control. The following values may be used:

PILOT CONTROL FORCE LIMITS (SECONDARY CONTROLS)

Control	Limit pilot loads
Miscellaneous:	
*Crank, wheel, or lever.	$\left(\frac{1+R}{3}\right)\times 50$ lbs., but not less than 50 lbs. nor more than 150 lbs. (R=radius). (Applicable to any angle within 20° of plane of control).
Twist	133 in. lbs.
Push-pull	To be chosen by applicant.

*Limited to flap, tab, stabilizer, spoiler, and landing gear operation controls.

[Revision note: Combines §§ 4b.227 and figure 4b–6]

GROUND LOADS

§ 25.261 Ground loads.

(a) *General.* The limit loads obtained from the conditions specified in §§ 25.263 through 25.301 are considered to be external forces applied to the airplane structure. In each of the specified ground load conditions, the external forces must be rationally or conservatively placed in equilibrium with the linear and angular inertia forces. In addition, the provisions of paragraphs (b) and (c) apply. Figure (1) of Appendix A contains the basic landing gear dimension data.

(b) *Center of gravity positions.* In applying each of the specified ground load conditions, the critical center of gravity positions within the certification limits must be selected so that the maximum design loads in each of the landing gear elements are obtained in the landing and the ground handling conditions.

(c) *Load factors, descent velocities, and design weights for landing conditions.* For the landing conditions specified in §§ 25.263 through 25.269, the airplane is assumed to be subjected to the forces and decent velocities prescribed in this paragraph:

(1) The selected limit vertical inertia load factors at the center of gravity of

the airplane may not be less than the values that would be obtained—

(i) In the attitude and subject to the drag loads associated with the particular landing condition;

(ii) With a limit descent velocity of 10 f.p.s. at the design landing weight; and

(iii) With a limit descent velocity of 6 f.p.s. at the design takeoff weight.

(2) A wing lift, not exceeding the airplane weight, may be assumed to exist throughout the landing impact and to act through the center of gravity of the airplane.

(3) The provisions of subparagraphs (1) and (2) of this paragraph apply to airplanes with conventional arrangements of main and nose gears, or main and tail gears, when normal operating techniques are used. The prescribed descent velocities may be modified if it is shown that the airplane has design features that make it impossible to develop these velocities. The minimum limit inertia load factors corresponding to the required limit descent velocities must be determined in accordance with § 25.463.

[Revision note: Based on § 4b.230]

§ 25.263 Level landing conditions.

(a) *General.* The following conditions apply:

(1) In the level attitude, the airplane is assumed to contact the ground at forward velocity components, ranging from V_{L_1} to 1.25 V_{L_2}, parallel to the ground, and to be subjected to the load factors prescribed in § 25.261(c)(1) with—

(i) V_{L_1} equal to V_{S_0} (TAS) at the appropriate landing weight and in standard sea level conditions; and

(ii) V_{L_2} equal to V_{S_0} (TAS) at the appropriate landing weight and altitudes in a hot day temperature of 41 degrees F. above standard.

(2) The effects of increased contact speeds must be investigated if approval of downwind landings exceeding 10 m.p.h. is desired.

(3) The following combinations of vertical and drag components are considered to be acting at the axle centerline:

(i) *Condition of maximum wheel spin-up load.* Drag components simulating the forces required to accelerate the wheel rolling assembly up to the specified ground speed must be combined with the vertical ground reactions existing at the instant of peak drag loads. The coefficient of friction between the tires and the ground may be established by considering the effects of skidding velocity and tire pressure. However, this coefficient of friction need not be greater than 0.8. This condition must be applied to the landing gear, directly affected attaching structure, and large mass items such as external fuel tanks and nacelles.

(ii) *Condition of maximum wheel vertical load.* An aft acting drag component of not less than 25 percent of the maximum vertical ground reaction must be combined with the maximum ground reaction of § 25.261(c).

(iii) *Condition of maximum spring-back load.* Forward-acting horizontal loads resulting from a rapid reduction of the spin-up drag loads must be combined with the vertical ground reactions at the instant of the peak forward load. This condition must be applied to the landing gear, directly affected attaching structure, and large mass items such as external fuel tanks and nacelles.

(b) *Level landing, tail-wheel type.* Investigate the conditions specified in paragraph (a) of this section with the airplane horizontal reference line horizontal in accordance with figure 2 of Appendix A.

(c) *Level landing, nose-wheel type.* The following airplane attitudes, shown in figure 2 of Appendix A, must be considered:

(1) Investigate the conditions specified in paragraph (a) of this section with the main wheels assumed to contact the ground with the nose wheel just clear of the ground.

(2) If an attitude in which the nose and main wheels contact the ground simultaneously can reasonably be attained at the specified descent and forward velocities, investigate the conditions specified in paragraph (a) of this section subject to the following:

(i) In conditions (a)(3)(i) and (a)(3)(iii), the nose and main gear may be separately investigated, neglecting the pitching moments due to wheel spin-up and spring-back loads.

(ii) In condition (a)(3)(ii), the pitching moment is assumed to be resisted by the nose gear.

[Revision note: Based on § 4b.231]

§ 25.265 Tail-down landing conditions.

(a) *General.* (1) The airplane is assumed to contact the ground at forward velocity components, ranging from V_{L_1} to V_{L_2}, parallel to the ground, and is subjected to the load factors prescribed in § 25.261(c)(1) with—

(i) V_{L_1} equal to V_{S_0} (TAS) at the appropriate landing weight and in standard sea level conditions; and

(ii) V_{L_2} equal to V_{S_0} (TAS) at the appropriate landing weight and altitudes in a hot day temperature of 41 degrees F. above standard.

(2) The combination of vertical and drag components specified in § 25.263(a)(3)(i) and (iii) is considered to be acting at the main wheel axle centerline.

(b) *Tail-wheel type.* The main and tail wheels are assumed to contact the ground simultaneously, in accordance with figure 3 of Appendix A. Ground reaction conditions on the tail wheel are assumed to act—

(1) Vertically; and

(2) Up and aft through the axle at 45 degrees to the ground line.

(c) *Nose-wheel type.* The airplane is assumed to be at an attitude corresponding to either the stalling angle or the maximum angle allowing clearance with the ground by all parts of the airplane other than the main wheels, in accordance with figure 3 of Appendix A, whichever is less.

[Revision note: Based on § 4b.232]

§ 25.267 One-wheel landing condition.

One side of the main landing gear is assumed to contact the ground while the airplane is in the level attitude, in accordance with figure 4 of Appendix A. The ground reactions must be the same as those obtained on that side in accordance with § 25.263(a)(3)(ii). The unbalanced external loads must be reacted by inertia of the airplane in a rational or conservative manner.

[Revision note: Based on § 4b.233]

§ 25.269 Lateral drift landing condition.

The airplane is assumed to be in the level attitude with only the main wheels contacting the ground, in accordance with figure 5 of Appendix A. Side loads of 0.8 of the vertical reaction (on one side) acting inward and 0.6 of the vertical reaction (on the other side) acting outward must be combined with one-half of the maximum vertical ground reactions obtained in the level landing conditions. These loads are assumed to be applied at the ground contact point and to be resisted by the inertia of the airplane. The drag loads may be assumed to be zero.

[Revision note: Based on § 4b.234]

§ 25.271 Rebound landing condition.

The landing gear and its supporting structure must be investigated for the loads occurring during rebound of the airplane from the landing surface. With the landing gear fully extended and not in contact with the ground, a load factor of 20.0 must act on the unsprung weights of the landing gear. This load factor must act in the direction of motion of the unsprung weights as they reach their limiting positions in extending with relation to the sprung portions of the landing gear.

[Revision note: Based on § 4b.234a]

GROUND LOADS; GROUND HANDLING CONDITIONS

§ 25.281 Ground handling conditions.

Unless otherwise prescribed, the landing gear and airplane structure must be investigated for the conditions in §§ 25.281 through 25.297 with the airplane at the design takeoff weight. No wing lift may be considered. The shock absorbers and tires may be assumed to be deflected to their static position.

[Revision note: Based on § 4b.235 (introductory paragraph) (less last sentence) (and less (a) through (b))]

§ 25.283 Takeoff run.

The landing gear and the airplane structure are assumed to be subjected to loads not less than those encountered under conditions described in § 25.155.

[Revision note: Based on § 4b.235(a)]

§ 25.285 Braked roll.

(a) *Tail-wheel type.* The airplane is assumed to be in the level attitude with all of the load on the main wheels, in accordance with figure 6 of Appendix A. The limit vertical load factor is 1.2 for the airplane at the design landing weight, and 1.0 for the airplane at the design takeoff weight. A drag reaction equal to the vertical reaction multiplied by a coefficient of friction of 0.8 must be combined with the vertical ground reaction and applied at the ground contact point.

(b) *Nose-wheel type.* The limit vertical load factor is 1.2 for the airplane at the design landing weight, and 1.0 for the airplane at the design takeoff weight. A drag reaction equal to the vertical reaction multiplied by a coefficient friction of 0.8 must be combined with the vertical reaction and applied at the ground contact point of each wheel with brakes. The following two airplane attitudes, in acordance with figure 6 of Appendix A, must be considered:

(1) The airplane is assumed to be in level attitude with all wheels contacting the ground and the loads distributed between the main and nose gear. Zero pitching acceleration is assumed.

(2) The airplane is assumed to be in the level attitude with only the main gear contacting the ground and with the pitching moment resisted by angular acceleration.

(c) In the conditions in paragraphs (a) and (b) of this section, a drag reaction lower than that prescribed may be used if it is substantiated that an effective drag force of 0.3 times the vertical reaction cannot be attained under any likely loading condition.

[Revision note: Based on § 4b.235 (introductory paragraph) (last sentence) and (b)]

§ 25.287 Turning.

The airplane in the static position, in accordance with figure 7 of Appendix A, is assumed to execute a steady turn by nose gear steering, or by application of sufficient differential power, so that the limit load factors applied at the center of gravity are 1.0 vertically and 0.5 laterally. The side ground reaction of each wheel must be 0.5 of the vertical reaction.

[Revision note: Based on § 4b.235(c)]

§ 25.289 Pivoting.

The airplane is assumed to pivot about one side of the main gear with the brakes on that side locked. The limit vertical load factor must be 1.0 and the coefficient of friction 0.8. The airplane is assumed to be in static equilibrium with the loads being applied at the ground contact points, in accordance with figure 8 of Appendix A.

[Revision note: Based on § 4b.235(d)]

§ 25.291 Nose-wheel yawing.

(a) A vertical load factor of 1.0 at the airplane center of gravity, and a side component at the nose wheel ground contact equal to 0.8 of the vertical ground reaction at that point, is assumed.

(b) The conditions of this paragraph must be applied to the design of the nose gear, its attaching structure, and the fuselage structure. The airplane is assumed to be in static equilibrium with the loads resulting from the application of the brakes on one side of the main gear. The vertical load factor at the center of gravity must be 1.0. The forward acting load at the airplane center of gravity must be 0.8 times the vertical load on one main gear. The side and vertical loads at the ground contact point on the nose gear must be those required for static equilibrium. The side load factor at the airplane center of gravity is assumed to be zero. If this condition results in a nose gear side load in excess of 0.8 times the vertical nose gear load, the design nose gear side load may be limited to 0.8 times the vertical load with the unbalanced yawing moments assumed to be resisted by aircraft inertia forces.

(c) The conditions of this paragraph apply to the landing gear and airplane structure. The loading conditions are those prescribed in paragraph (b) of this section except that—

(1) A lower drag reaction may be used if it is substantiated that an effective drag force of 0.8 times the vertical reaction cannot be attained under any likely loading condition; and

(2) The forward acting load at the center of gravity need not exceed the maximum drag reaction on one main gear, determined in accordance with § 25.285(b).

[Revision note: Based on § 4b.235 (introductory paragraph) (last sentence) and (e)]

§ 25.293 Tail-wheel yawing.

(a) A vertical ground reaction equal to the static load on the tail wheel, in combination with a side component of equal magnitude, is assumed.

(b) If there is a swivel, the tail wheel is assumed to be swiveled 90° to the airplane longitudinal axis with the resultant load passing through the axle. If there is a lock, steering device, or shimmy damper the tail wheel is also assumed to be in the trailing position with the side load acting at the ground contact point.

[Revision note: Based on § 4b.235(f)]

§ 25.295 Reversed braking.

The airplane must be in a three point static ground attitude. Horizontal reactions parallel to the ground and directed forward must be applied at the ground contact point of each wheel with brakes. The limit loads must be equal either to 0.55 times the vertical load at each wheel or to the load developed by 1.2 times the nominal maximum static brake torque, whichever is less. For nose-wheel types, the pitching moment must be balanced by rotational inertia. For tail-wheel types, the resultant of the ground reactions must pass through the center of gravity of the airplane.

[Revision note: Based on § 4b.235(g)]

§ 25.297 Towing loads.

(a) Towing loads are specified in paragraph (d) of this section. Each condition must be considered separately. These loads must be applied at the towing fittings and must act parallel to the ground. A vertical load factor equal to 1.0 must be considered acting at the center of gravity. The shock struts and tires must be in their static positions. With W_T as the design maximum takeoff weight, the towing load, F_{TOW}, is—

(1) 0.3 W_T for W_T less than 30,000 pounds;

(2) $\frac{6W_T+450,000}{70}$ for W_T between 30,000 and 100,000 pounds; and

(3) 0.15 W_T for W_T over 100,000 pounds.

(b) For towing points not on the landing gear but located near the plane of symmetry of the airplane, the drag and side tow load components specified for the auxiliary gear apply. For towing points located outboard of the main gear, the drag and side tow load components specified for the main gear apply. Where the specified angle of swivel cannot be obtained, the maximum obtainable angle must be used.

(c) The towing loads specified in paragraph (d) of this section have the following balancing forces:

(1) The side component of the towing load at the main gear is reacted by a side force at the static ground line of the wheel to which the load is applied.

(2) The towing loads at the auxiliary gear and the drag components of the towing loads at the main gear are reacted as follows:

(i) A reaction with a maximum value equal to the vertical reaction is applied at the axle of the wheel to which the load is applied. Sufficient airplane inertia to achieve equilibrium is applied.

(ii) The loads are reacted by airplane inertia.

(d) The following loads must be used:

Tow point	Position	Load		
		Magnitude	No.	Direction
Main gear.		0.75 F_{TOW} per main gear unit.	1	Forward, parallel to drag axis.
			2	Forward, at 30° to drag axis.
			3	Aft, parallel to drag axis.
			4	Aft, at 30° to drag axis.
Auxiliary gear.	Swiveled forward.	1.0 F_{TOW}.	5	Forward.
			6	Aft.
	Swiveled aft.		7	Forward.
			8	Aft.
	Swiveled 45° from forward.	0.5 F_{TOW}.	9	Forward, in plane of wheel.
			10	Aft, in plane of wheel.
	Swiveled 45° from aft.		11	Forward, in plane of wheel.
			12	Aft, in plane of wheel.

[Revision note: Combines §§ 4b.235 (less introductory paragraphs and (a) through (g)) and figure 4b–26]

§ 25.301 Ground loads; unsymmetrical loads on multiple-wheel units.

(a) *General.* Multiple-wheel landing gear units are assumed to be subjected to the limit ground loads prescribed in this subpart in accordance with the provisions of paragraph (b) and (c) of this section. A tandem strut gear arrangements is a multiple-wheel unit.

(b) *Distribution of limit loads to wheels; all tires inflated.* The distribution of the limit loads among the wheels of the landing gear must be established for all landing, taxiing, and ground handling conditions, taking into account the effects of the following factors:

(1) The number of wheels and their physical arrangement. For truck type landing gear units, the effects of any seesaw motion of the truck during the landing impact must be considered in determining the maximum design loads for the fore and aft wheel pairs.

(2) Any differentials in tire diameters resulting from a combination of manufacturing tolerances, tire growth, and tire wear. A maximum tire-diameter differential equal to ⅔ of the most unfavorable combination of diameter variations that is obtained when taking into account manufacturing tolerances, tire growth, and tire wear, may be assumed.

(3) Any unequal tire inflation pressure, assuming the maximum variation to be ±5 percent of the nominal tire inflation pressure.

(4) A runway crown of zero and a runway crown having a convex upward shape that may be approximated by a slope of 1½ percent with the horizontal. Runway crown effects must be considered with the nose gear unit on either slope of the crown.

(5) The airplane attitude.

(6) Any structural deflections.

(c) *Deflated tires.* The effect of deflated tires on the structure must be considered with respect to the loading conditions specified in subparagraphs (1), (2), and (3) of this paragraph taking into account the physical arrangement of the gear components. The deflation of any one tire for all multiple wheel landing gear units, and the deflation of any two critical tires for landing gear units using four or more wheels per unit, must be considered. The ground reactions must be applied to the wheels with inflated tires except that, for multiple-wheel gear units with more than one shock strut, a rational distribution of the ground reactions between the deflated and inflated tires, taking into account the differences in shock strut extensions resulting from a deflated tire, may be used.

(1) *Landing conditions.* For one and for two deflated tires, the applied load to each gear unit is assumed to be 60 percent and 50 percent, respectively, of the limit load applied to each gear for each of the prescribed landing conditions. However, for the drift landing condition of § 25.269, 100 percent of the vertical load must be applied.

(2) *Taxiing and ground handling conditions.* For one and for two deflated tires, the applied side or drag load factor, or both factors, at the center of gravity must be the most critical value up to 50 percent and 40 percent, respectively, of the limit side or drag load factors, or both factors, corresponding to the most severe condition resulting from consideration of the prescribed taxiing and ground handling conditions. However, for the braked roll conditions of § 25.295 (a) and (b)(2), the drag loads on each inflated tire may not be less than those at each tire for the symmetrical load distribution with no deflated tires. For one and for two deflated tires, the vertical load factor at the center of gravity must be 60 percent and 50 percent, respectively, of the factor with no deflated tires, except that it may not be less than 1g. Pivoting need not be considered.

(3) *Towing conditions.* For one and for two deflated tires, the towing load, F_{TOW}, must be 60 percent and 50 percent, respectively, of the load prescribed.

(d) In determining the total load on a gear unit with respect to the provisions of paragraphs (b) and (c) of this section, the transverse shift in the load centroid, due to unsymmetrical load distribution on the wheels, may be neglected.

[Revision note: Based on § 4b.236]

WATER LOADS

§ 25.311 General.

(a) Seaplanes must be designed for the water loads developed during takeoff and landing, with the seaplane in any attitude likely to occur in normal operation, and at the appropriate forward and sinking velocities under the most severe sea conditions likely to be encountered. Unless a more rational analysis of the water loads is made, or the requirements of ANC-3 are used, §§ 25.313 through 25.327 apply.

(b) The requirements of this section and §§ 25.313 through 25.327 apply also to amphibians.

[Revision note: Combines §§ 4b.250 and 4b.250-1]

§ 25.313 Design weights and center of gravity positions.

(a) *Design weights.* The water load requirements must be complied with at all operating weights up to the design landing weight except that, for the takeoff condition prescribed in § 25.321, the design takeoff weight must be used.

(b) *Center of gravity positions.* The critical center of gravity positions within the limits for which certification is requested must be considered to obtain maximum design loads for each part of the seaplane structure.

[Revision note: Based on § 4b.251]

§ 25.315 Application of loads.

Except as otherwise prescribed, the seaplane as a whole is assumed to be subjected to the loads corresponding to the load factors specified in § 25.317. In applying the loads resulting from the load factors prescribed in § 25.317, the loads may be distributed over the hull or main float bottom (in order to avoid excessive local shear loads and bending moments at the location of water load application) using pressures not less than those prescribed in § 25.323(b).

(b) For twin float seaplanes, each float must be treated as an equivalent hull on a fictitious seaplane with a weight equal to one-half the weight of the twin float seaplane.

(c) Except in the takeoff condition of § 25.321, the aerodynamic lift on the seaplane during the impact is assumed to be ⅔ of the weight of the seaplane.

[Revision note: Based on § 4b.252]

§ 25.317 Hull and main float load factors.

(a) Water reaction load factors n_W must be computed in the following manner:

(1) For the step landing case

$$n_W=\frac{C_1 V_{S_0}{}^2}{\tan^{2/3}\beta W^{1/3}}.$$

(2) For the bow and stern landing cases

$$n_W=\frac{C_1 V_{S_0}{}^2}{\tan^{2/3}\beta W^{1/3}}\times\frac{K_1}{(1+r_x{}^2)^{2/3}}.$$

(b) The following values are used:

(1) n_W=water reaction load factor (that is, the water reaction divided by seaplane weight).

(2) C_1=empirical seaplane operations factor equal to 0.009 (except that this factor may not be less than that necessary to obtain the minimum value of step load factor of 2.33).

(3) V_{S_0}=seaplane stalling speed (mph) with landing flaps extended in the appropriate position and with no slipstream effect.

(4) β=angle of dead rise at the longitudinal station at which the load factor is being determined, in accordance with figure 1 of Appendix B.

(5) W=seaplane design landing weight in pounds.

(6) K_1=empirical hull station weighing factor, in accordance with figure 2 of Appendix B. For a twin float seaplane, because of the effect of flexibility of the attachment of the floats to the seaplane, the factor K_1 may be reduced at the bow and stern to 0.8 of the value shown in figure 2 of Appendix B. This reduction applies only to the design of the carrythrough and seaplane structure.

(7) r_x=ratio of distance, measured parallel to hull reference axis, from the center of gravity of the seaplane to the hull longitudinal station at which the load factor is being computed to the radius of gyration in pitch of the seaplane, the hull reference axis being a straight line, in the plane of symmetry, tangential to the keel at the main step.

[Revision note: Based on § 4b.253]

§ 25.319 Hull and main float landing conditions.

(a) *Symmetrical step, bow, and stern landing.* For symmetrical step, bow, and stern landings, the limit water reaction load factors are those computed in accordance with § 25.317:

(1) For symmetrical step landings, the resultant water load must be applied at the keel, through the center of gravity, and must be directed perpendicularly to the keel line.

(2) For symmetrical bow landings, the resultant water load must be applied at the keel, one-fifth of the longitudinal distance from the bow to the step, and must be directed perpendicularly to the keel line.

(3) For symmetrical stern landings, the resultant water load must be applied at the keel, at a point 85 percent of the longitudinal distance from the step to the stern post, and must be directed perpendicularly to the keel line.

(b) *Unsymmetrical landing for hull and single float seaplanes.* Unsymmetrical step, bow, and stern landing conditions must be investigated. The loading for each condition consists of an upward component and a side component equal, respectively, to 0.75 and 0.25 tan β times the resultant load in the corresponding symmetrical landing condition. The point of application and direction of the upward component of the load is the same as that in the symmetrical condition, and the point of application of the side component is at the same longitudinal station as the upward component but is directed inward perpendicularly to the plane of symmetry at a point midway between the keel and chine lines.

(c) *Unsymmetrical landing; twin float seaplanes.* The unsymmetrical loading consists of an upward load at the step of each float of 0.75 and a side load of 0.25 tan β at one float times the step landing load obtained in accordance with § 25.317. The side load is directed inboard, perpendicularly to the plane of symmetry midway between the keel and chine lines of the float, at the same longitudinal station as the upward load.

[Revision note: Based on § 4b.254]

§ 25.321 Hull and main float takeoff condition.

This section applies to the design of the wing and its attachment to the hull or main float. The aerodynamic wing lift is assumed to be zero. A downward inertia load, corresponding to the following load factor, must be applied:

$$n=\frac{C_{T_0}V_{S_1}{}^2}{\tan^{2/3}\beta W^{1/3}}$$

where—

n=inertia load factor;
C_{T_0}=empirical seaplane operations factor equal to 0.003;
V_{S_1}=seaplane stalling speed (mph) at the design takeoff weight with the flaps extended in the appropriate takeoff position;
β=angle of dead rise at the main step (degrees); and
W=seaplane design takeoff weight in pounds.

[Revision note: Based on § 4b.255]

§ 25.323 Hull and main float bottom pressures.

The hull and main float structure, including frames and bulkheads, stringers, and bottom plating, must be designed in accordance with the provisions of this section. In the absence of more rational data, the pressures and distributions are as follows:

(a) *Local pressures.* For the design of the bottom plating and stringers and their attachments to the supporting structure, the following pressure distributions are applicable. The area over which these pressures are applied must simulate pressures occurring during high localized impacts on the hull or float, but need not extend over an area which would induce critical stresses in the frames or in the overall structure:

(1) For an unflared bottom, the pressure at the chine is 0.75 times the pressure at the keel, and the pressures between the keel and chine vary linearly, in accordance with figure 3 of Appendix B. The pressure at the keel (psi) is computed as follows:

$$P_k=C_2\frac{K_2V_{S_1}{}^2}{\tan\beta_k}$$

where—

P_k=pressure at the keel;
C_2=0.0016;
K_2=hull station weighing factor, in accordance with figure 2 of Appendix B;
V_{S_1}=seaplane stalling speed (mph) at the design takeoff weight with flaps extended in the appropriate takeoff position; and
β_K=angle of dead rise at keel, in accordance with figure 1 of Appendix B.

(2) For a flared bottom, the pressure at the beginning of the flare is the same as that for an unflared bottom, and the pressure between the chine and the beginning of the flare varies linearly, in accordance with figure 3 of Appendix B. The pressure distribution is the same as that prescribed in subparagraph (1) of this paragraph for an unflared bottom except that the pressure at the chine is computed as follows:

$$P_{ch}=C_3\frac{K_2V_{S_1}{}^2}{\tan\beta}$$

where—

P_{ch}=pressure at the chine;
C_3=0.0012;
K_2=hull station weighing factor, in accordance with figure 2 of Appendix B;
V_{S_1}=seaplane stalling speed (mph) at the design takeoff weight with flaps extended in the appropriate takeoff position; and
β=angle of dead rise at appropriate station.

(b) *Distributed pressures.* For the design of the frames, keel, and chine structure, the following pressure distributions apply. These pressures are uniform and must be applied simultaneously over the entire hull or main float bottom. The loads obtained must be carried into the sidewall structure of the hull proper, but need not be transmitted in a fore and aft direction as shear and bending loads.

(1) Symmetrical pressures are computed as follows:

$$P=C_4\frac{K_2V_{S_0}{}^2}{\tan\beta}$$

where—

P=pressure;
C_4=0.078 C_1 (with C_1 computed in accordance with § 25.317;
K_2=hull station weighing factor, determined in accordance with figure 2 of Appendix B;
V_{S_0}=seaplane stalling speed (mph) with landing flaps extended in the appropriate position and with no slipstream effect; and
β=angle of dead rise at appropriate station.

(2) The unsymmetrical pressure distribution consists of the pressures prescribed in subparagraph (1) of this paragraph on one side of the hull or main float centerline and one-half of that pressure on the other side of the hull or main float centerline, in accordance with figure 3 of Appendix B.

[Revision note: Based on § 4b.256]

§ 25.325 Auxiliary float loads.

Auxiliary floats and their attachments and supporting structures must be designed for the following conditions. In the cases specified in paragraphs (a), (b), (c), and (d) of this section, the prescribed water loads may be distributed over the float bottom to avoid excessive local loads, using bottom pressures not less than those prescribed in paragraph (f) of this section.

(a) *Step loading.* The resultant water load must be applied in the plane of symmetry of the float at a point three-fourths of the distance from the bow to the step and must be perpendicular to the keel. The resultant limit load is computed as follows, except that the value of L need not exceed three times the weight of the displaced water when the float is completely submerged:

$$L=\frac{C_5\ V_{S_0}{}^2\ W^{2/3}}{\tan^{2/3}\beta_s(1+r_y{}^2)^{2/3}}$$

where—

L=limit load;
C_5=0.004;
V_{S_0}=seaplane stalling speed (mph) with landing flaps extended in the appropriate position and with no slipstream effect;
W=seaplane design landing weight in pounds;
β_s=angle of dead rise at a station ¾ of the distance from the bow to the step, but need not be less than 15 degrees; and
r_y=ratio of the lateral distance between the center of gravity and the plane of symmetry of the float to the radius of gyration in roll.

(b) *Bow loading.* The resultant limit must be applied in the plane of symmetry of the float at a point one-fourth of the distance from the bow to the step and must be perpendicular to the tangent to the keel line at that point. The magnitude of the resultant load is that specified in paragraph (a) of this section.

(c) *Unsymmetrical step loading.* The resultant water load consists of a component equal to 0.75 times the load specified in paragraph (a) of this section and a side component equal to 0.25 tan β times the load specified in paragraph (a) of this section. The side load must be applied perpendicularly to the plane of symmetry of the float at a point midway between the keel and the chine.

(d) *Unsymmetrical bow loading.* The resultant water load consists of a component equal to 0.75 times the load specified in paragraph (b) of this section and a side component equal to 0.25 tan β times the load specified in paragraph (b) of this section. The side load must be applied perpendicularly to the plane of symmetry at a point midway between the keel and the chine.

(e) *Immersed float condition.* The resultant load must be applied at the centroid of the cross section of the float at a point one-third of the distance from the bow to the step. The limit load components are

vertical $= \rho g V$,

$$\text{aft} = C_x \frac{\rho}{2} V^{2/3} (KV_{S_0})^2, \text{ and}$$

$$\text{side} = C_y \frac{\rho}{2} V^{2/3} (KV_{S_0})^2,$$

where—

ρ = mass density of water;
V = volume of float;
C_x = coefficient of drag force, equal to 0.10;
C_y = coefficient of side force, equal to 0.08;
K = 0.8, except that lower values may be used if it is shown that the floats are incapable of submerging at a speed of 0.8 V_{S_0} in normal operations;
V_{S_0} = seaplane stalling speed (mph) with landing flaps extended in the appropriate position and with no slipstream effect; and
g = acceleration due to gravity (ft/sec^2).

(f) *Float bottom pressures.* The float bottom pressures must be established in accordance with § 25.323. The angle of dead rise to be used in determining the float bottom pressures is set forth in paragraph (a) of this section.

[Revision note: Based on § 4b.257]

§ 25.327 Seawing loads.

Seawing design loads must be based on applicable test data.

[Revision note: Based on § 4b.258]

EMERGENCY LANDING CONDITIONS

§ 25.331 Structural design for emergency landing conditions.

(a) The structure must be designed so that, although parts of the airplane may be damaged, there is every reasonable probability that all of the occupants (if they make proper use of the seats, belts, and other provisions made in the design) will escape serious injury in a minor crash landing (with wheels up if the airplane has retractable landing gear) in which they experience ultimate inertia forces relative to the surrounding structure of—

(1) Upward	2.0g;
(2) Downward	4.5g;
(3) Forward	9.0g; and
(4) Sideward	1.5g.

(b) A lesser value of the downward inertia force specified in paragraph (a) of this section may be used if it is shown that the airplane structure can absorb the landing loads corresponding to the design landing weight and an ultimate descent velocity of 5 f.p.s., without exceeding the value chosen.

(c) The inertia forces specified in paragraph (a) of this section must be applied to all items of mass which would be apt to injure the passengers or crew if these items became loose in a minor crash landing. The supporting structure must be designed to restrain these items.

[Revision note: Based on § 4b.260]

§ 25.333 Structural ditching provisions.

Structural strength considerations of ditching provisions must be in accordance with § 25.531(d).

[Revision note: Based on § 4b.261]

FATIGUE EVALUATION

§ 25.341 Fatigue evaluation of flight structure.

(a) *Strength, detail design, and fabrication.* Those parts of the airplane structure (including wings, fixed and movable control surfaces, the fuselage, and all their related primary attachments), the failure of which could result in catastrophic failure of the airplane, must be evaluated in accordance with the provisions of either paragraph (b) or (c) of this section.

(b) *Fatigue strength.* (1) The structure must be shown by analysis, tests, or both, to be capable of withstanding the repeated loads of variable magnitude expected in service. The evaluation must include—

(i) The typical loading spectrum expected in service;

(ii) Identification of principal structural elements and detail design points, the fatigue failure of which could cause catastrophic failure of the airplane; and

(iii) An analysis or repeated load tests, or a combination of analysis and load tests, of principal structural elements and detail design points identified in subdivision (ii) of this subparagraph.

(2) The service history of airplanes of similar structural design, taking due account of differences in operating conditions and procedures, may be utilized.

(3) When circumstances require substantiation of the pressure cabin by fatigue tests, the cabin or representative parts of it must be cycle-pressure tested, utilizing the normal operating pressure together with the effects of external aerodynamic pressure combined with the flight loads. The effects of flight loads may be represented by an increased cabin pressure or may be omitted if they are shown to have no significant effect upon fatigue.

(c) *Fail safe strength.* It must be shown by analysis, tests, or both, that catastrophic failure or excessive structural deformation, that could adversely affect the flight characteristics of the airplane, are not probable after fatigue failure or obvious partial failure of a single principal structural element. After these types of failure of a single principal structural element, the remaining structure must be capable of withstanding static loads corresponding to the flight loading condition specified in subparagraphs (1) through (4) of this paragraph. These loads must be multiplied by a factor of 1.15 unless the dynamic effects of failure under static load are otherwise considered. For a pressurized cabin, the normal operating pressures combined with the expected external aerodynamic pressures must be applied simultaneously with the flight loading conditions specified in this paragraph.

(1) An ultimate maneuvering load factor of 2.0 at V_C.

(2) Gust loads as specified in §§ 25.211 and 25.219(b) except that these gust loads are considered to be ultimate loads and the gust velocities are—

(i) At speed V_B, 49 fps from sea level to 20,000 feet altitude, thereafter decreasing linearly to 28 fps at 50,000 feet altitude;

(ii) At speed V_C, 33 fps from sea level to 20,000 feet altitude, thereafter decreasing linearly to 16.5 fps at 50,000 feet altitude; and

(iii) At speed V_D, 15 fps from sea level to 20,000 feet altitude, thereafter decreasing linearly to 6 fps at 50,000 feet altitude.

(3) Eighty percent of the limit loads resulting from the conditions specified in § 25.241(c). These loads are considered to be ultimate loads.

(4) Eighty percent of the limit maneuvering loads resulting from the conditions specified in § 25.219(a), except that the load need not exceed 100 percent of the critical load obtained in compliance with § 25.219(a), using a pilot effort of 180 pounds. This load is an ultimate load.

[Revision note: Combines §§ 4b.270 and 4b.270-1]

§ 25.343 Fatigue evaluation of landing gear.

(a) The strength, detail design, and fabrication of those parts of the airplane landing gear and its attachment fittings in which fatigue may be critical, must be evaluated in accordance with either the provisions of paragraph (b) or (c) of this section.

(b) Fatigue strength:

(1) The fatigue strength of the landing gear must be evaluated. The evaluation must include—

(i) The typical loading spectrum expected in service;

(ii) Identification of principal structural elements and detail design points, the fatigue failure of which could cause catastrophic failure of the landing gear; and

(iii) Analysis or repeated load testing of the principal structural elements and detail design points identified in subdivision (ii) of this subparagraph.

(2) Where the evaluation indicates its necessity, inspection or other procedures must be established to prevent catastrophic fatigue failure.

(3) The service history of airplanes of similar structural design, taking due account of differences in operating conditions and procedures, may be used.

(c) Fail safe strength: It must be shown by analysis or tests that catastrophic failure is not probable after fatigue, failure, or obvious partial failure, of any single principal structural element. After these kinds of failure, the remaining structure must be able to withstand static loads corresponding to 80 percent of the limit loads resulting from the conditions prescribed in § 25.261. These static loads are ultimate loads.

[Revision note: Based on § 4b.271]

Subpart D—Design and Construction

GENERAL REQUIREMENTS

§ 25.391 General.

The airplane may not have design features or details that experience has shown to be hazardous or unreliable. The suitability of all questionable design details or parts must be established by tests.

[Revision note: Based on § 4b.300]

§ 25.393 Materials.

The suitability and durability of all materials used in the airplane structure must be established on the basis of experience or tests. All materials used in the airplane structure must conform to approved specifications (such as industry or military specifications, or Technical Standard Orders) that ensure that they have the strength and other properties assumed in the design data.

[Revision note: Combines § 4b.301 and first sentence of § 4b.301-1]

§ 25.395 Fabrication methods.

The methods of fabrication used must produce a consistently sound structure. If a fabrication process (such as gluing, spot welding, or heat treating) requires close control to reach this objective, the process must be performed in accordance with an approved process specification.

[Revision note: Based on § 4b.302]

§ 25.397 Standard fastenings.

All bolts, pins, screws, and rivets used in the structure must be approved. An approved locking device or method must be used for all these bolts, pins, and screws. Self-locking nuts may not be used on bolts that are subject to rotation in operation.

[Revision note: Based on § 4b.303]

§ 25.399 Protection.

All members of the structure must be suitably protected against deterioration or loss of strength in service due to weathering, corrosion, abrasion, or other causes. In seaplanes or amphibians special precautions must be taken against corrosion from salt water, particularly where dissimilar metals are in close proximity. Provisions for ventilation and drainage of all parts of the structure must be made where necessary for protection.

[Revision note: Based on § 4b.304]

§ 25.401 Inspection provisions.

There must be means to allow close examination of all parts requiring periodic inspection, adjustment for proper alignment and function, and lubrication.

[Revision note: Based on § 4b.305]

§ 25.403 Material strength properties and design values.

(a) Material strength properties must be based on a sufficient number of tests of material conforming to specifications to establish design values on a statistical basis. The design values must be chosen so that the probability of any structure being understrength because of material variations is extremely remote. The effects of temperature on allowable stresses used for design in an essential component or structure must be considered where thermal effects are significant under normal operating conditions.

(b) The strength, detail design, and fabrication of the structure must minimize the probability of disastrous fatigue failure.

(c) Values contained in MIL-HDBK-5, "Metallic Materials and Elements for Flight Vehicle Structure," MIL-HDBK-17, "Plastics for Flight Vehicles, Part I—Reinforced Plastics", ANC-17 "Plastics for Aircraft, Part II—Transparent Glazing Materials", ANC-18 "Design of Wood Aircraft Structures", MIL-HDBK-23, "Composite Construction for Flight Vehicles, Part I—Fabrication Inspection Durability and Repair", and ANC-23 "Sandwich Construction for Aircraft, Part II—Material Properties and Design Criteria" must be used unless they are shown to be inapplicable. These manuals may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20401.

(d) Design properties outlined in MIL-HDBK-5 may be used subject to the following conditions:

(1) Where applied loads are eventually distributed through a single member within an assembly, the failure of which would result in the loss of structural integrity of the component involved, the guaranteed minimum design mechanical properties ("A" values) listed in MIL-HDBK-5 must be met.

(2) Redundant structures in which the failure of individual elements would result in applied loads being safely distributed to other load-carrying members, may be designed on the basis of the "90 percent probability ("B" values)" listed in MIL-HDBK-5.

(e) Design values greater than the guaranteed minimums required by paragraph (d) of this section may be used in applications where only guaranteed minimum values are normally allowed if a "premium selection" of the material is made in which a specimen of each individual item is tested before use to determine that the actual strength properties of that particular item will equal or exceed those used in design.

[Revision note: Combines §§ 4b.306 and 4b.306-1 (less (c))]

§ 25.405 Special factors.

The factors of safety prescribed in § 25.193 must be multiplied by the special factors of safety prescribed in §§ 25.407 through 25.411 when, for a particular part of the structure—

(a) There is uncertainty concerning its actual strength;

(b) Its strength is likely to deteriorate in service before normal replacement of the part; or

(c) Its strength is subject to appreciable variability because of uncertainties in manufacturing processes and inspection methods.

[Revision note: Based on § 4b.307 (less (a) through (c))]

§ 25.407 Casting factors.

(a) For structural castings, the factor of safety prescribed in § 25.193 must be multiplied by the casting factors specified in paragraphs (b) and (c) of this section. The prescribed tests and inspections are in addition to those necessary to establish foundry quality control. Castings must be inspected in accordance with approved specifications.

(b) Each casting, the failure of which would preclude continued safe flight and landing of the airplane or would result in serious injury to occupants, must have a casting factor of at least 1.25 and must receive 100 percent inspection by visual, radiographic, and magnetic particle or penetrant inspection methods or approved equivalent nondestructive inspection methods. Where these castings have a casting factor less than 1.50, three sample castings must be static tested. The test castings must conform to the strength requirements of § 25.195 at an ultimate load corresponding to a casting factor of 1.25 and must conform to the deformation requirements at a load equal to 1.15 times the limit load.

(c) For structural castings other than those specified in paragraph (b) of this section, the casting factors and inspections must conform to the following table except that the percentage of castings inspected by nonvisual methods may be reduced if an approved quality control procedure is established. A casting factor of 1.0 may be used for castings procured to a specification that guarantees the mechanical properties of the material in the castings and provides for demonstration of these properties by test of coupons cut from castings on a sampling basis. The inspection requirements for these castings must be in accordance with those specified in the following table for casting factors of 1.25 to 1.50, and the testing requirements must be in accordance with paragraph (b) of this section:

INSPECTION METHODS

Casting factor	*Inspections*
2.0 or more	100 percent visual.
Less than 2.0 but more than 1.5.	100 percent visual, and magnetic particle or penetrant or equivalent nondestructive inspection methods.
1.25 to 1.50	100 percent visual, magnetic particle or penetrant, and radiographic, or approved equivalent nondestructive inspection methods.

(d) Castings that are pressure tested as parts of a hydraulic or fluid system and do not support airplane structural loads need not conform to this section.

(e) The casting factor need not exceed 1.25 for bearing stresses regardless of the method of inspection employed. A casting factor need not be used for the bearing surface of a part if the bearing factor used is greater than the casting factor.

[Revision note: Based on § 4b.307(a)]

§ 25.409 Bearing factors.

(a) Bearing factors of sufficient magnitude to allow for the effects of normal relative motion between parts, and in joints with clearance (free fit) that are subject to pounding or vibration, must be used. Bearing factor values for control surface and system joints are specified in §§ 25.425 and 25.455.

(b) A bearing factor need not be used for a part if another prescribed special factor is greater than the bearing factor.

[Revision note: Based on § 4b.307(b)]

§ 25.411 Fitting factors.

(a) A fitting factor of at least 1.15 must be used in the analysis of all fittings whose strength is not proven by limit and ultimate load tests in which the actual stress conditions are simulated in the fitting and the surrounding structure. This factor applies to all parts of the fitting, the means of attachment, and the bearing on the members joined.

(b) Parts with integral fittings must be treated as a fitting up to the point where the section properties become typical of the member.

(c) The fitting factor need not be used where a type of joint made in accordance with approved practices (such as continuous joints in metal plating, welded joints, and scarf joints in wood) is based on comprehensive test data.

(d) A fitting factor need not be used with respect to the bearing surface of a part if the bearing factor used is greater than the fitting factor.

[Revision note: Based on § 4b.307(c)]

§ 25.413 Flutter, deformation, and vibration.

Compliance with the provisions in paragraphs (a) through (c) of this section must be shown by calculations, resonance tests, or other tests found necessary by the Administrator.

(a) *Flutter prevention.* The airplane must be designed to be free from flutter of wing and tail units (including all control and trim surfaces) and from divergence (that is, unstable structural distortion due to aerodynamic loading) at all speeds up to 1.2 V_D. A smaller margin above V_D may be used if the characteristics of the airplane (including the effects of compressibility) make a speed of 1.2 V_D unlikely to be reached, and if it is shown that a proper margin of damping exists at speed V_D. In the absence of more accurate data, the terminal velocity in a dive of 30 degrees to the horizontal may be used as the maximum speed likely to be reached. If concentrated balance weights are used on control surfaces, their effectiveness and strength (including supporting structure) must be substantiated. If control surface flutter dampers are installed to meet the requirements of this section, it must be shown that a single failure in the flutter damper system will not prevent continued safe flight of the airplane at any speed up to V_D.

(b) *Loss of control due to structural deformation.* The airplane must be designed to be free from control reversal and from undue loss of longitudinal, lateral, and directional stability and control, as a result of structural deformation (including that of the control surface covering) at all speeds up to the speed prescribed in paragraph (a) of this section for flutter prevention.

(c) *Vibration and buffeting.* The airplane must be designed to withstand all vibration and buffeting that might occur in any likely operating condition.

[Revision note: Based on § 4b.308]

CONTROL SURFACES (FIXED AND MOVABLE)

§ 25.421 Proof of strength.

(a) Limit load tests of control surfaces are required. These tests must include the horn or fitting to which the control system is attached.

(b) Compliance with the special factors requirements of §§ 25.405 through 25.411 and 25.425 for control surface hinges must be shown by analysis or individual load tests.

[Revision note: Based on § 4b.311]

§ 25.423 Installation.

Movable tail surfaces must be installed so that there is no interference between any surfaces when one is held in its extreme position and all the others are operated through their full angular movement. When an adjustable stabilizer is used, there must be stops that, in the event of failure of the adjusting mechanism, will limit its travel to a range equal to the maximum for which the airplane is shown to comply with the trim requirements of § 25.111.

[Revision note: Based on § 4b.312]

§ 25.425 Hinges.

Control surface hinges, except ball and roller bearing hinges, must have a factor of safety of not less than 6.67 with respect to the ultimate bearing strength of the softest material used as a bearing. For hinges with ball or roller bearings, the approved rating of the bearing may not be exceeded. Hinges must have enough strength and rigidity for loads parallel to the hinge line.

[Revision note: Based on § 4b.313]

CONTROL SYSTEMS

§ 25.431 General.

(a) All controls and control systems must operate with ease, smoothness, and positiveness, appropriate to their function. The elements of the flight control system must have design features, or must be distinctively and permanently marked, to minimize the possibility of incorrect assembly that could result in malfunctioning of the control system. Tab control systems must be designed so that disconnection or failure of any element at speeds up to V_C cannot jeopardize the safety of flight. An adjustable stabilizer must have means to allow any adjustment necessary for continued safety of the flight after the occurrence of any reasonably probable single failure of the actuating system.

(b) Power-boost and power-operated control systems must be designed in accordance with the provisions of subparagraphs (1) and (2) of this paragraph.

(1) If a power-boost or power-operated control system is used, an alternate system must be immediately available to allow continued safe flight and landing in the event of a single failure in the power portion. The alternate system may be a duplicate power portion or a manually operated mechanical system. The power portion includes the power source, such as hydraulic pumps, and other items, such as valves, lines, and actuators. The failure of mechanical parts (such as piston rods and links) and the jamming of power cylinders need not be considered if the probability of failure or jamming is extremely remote.

(2) Both the primary and alternate systems must be operable if any engine fails. For airplanes with more than two engines, at least one system must be operable if any two engines fail. It must be shown by analysis that the airplane is controllable if all engines fail.

[Revision note: Based on § 4b.320]

§ 25.433 Two-control airplanes.

Two-control airplanes must be able to continue safely in flight and landing if any one connecting element in the directional-lateral flight control system fails.

[Revision note: Based on § 4b.321]

§ 25.435 Trim controls and systems.

(a) Trim controls must be designed to prevent inadvertent or abrupt operation and to operate in the plane, and with the sense of motion, of the airplane.

(b) There must be means adjacent to the trim control to indicate the direction of the control movement relative to the airplane motion. In addition, there must be clearly visible means to indicate the position of the trim device with respect to the range of adjustment.

(c) Trim devices must be able to continue normal operation if any one connecting or transmitting element of the primary flight control system fails. Trim control systems must be designed to prevent creeping in flight. Trim tab controls must be irreversible unless the tab is appropriately balance and shown to be free from flutter.

(d) If an irreversible tab control system is used, the part from the tab to the attachment of the irreversible unit to the airplane structure must consist of a rigid connection.

[Revision note: Based on § 4b.322]

§ 25.437 Wing flap controls.

(a) The wing flap controls must be designed so that the flight crew can place the flaps in all of the takeoff, en route, approach, and landing positions established under § 25.35. The flaps must maintain these positions, except for flap movement produced by an automatic flap positioning or load limiting device, without further attention by the flight crew. In addition, the wing flap control must be designed and located so that it is improbable that it would be inadvertently actuated.

(b) The wing flap controls must be designed so that the rate of motion of the wing flap in response to the operation of the control and the characteristics of the automatic flap positioning or load limiting device give satisfactory flight and performance characteristics under steady or changing conditions of airspeed, engine power, and airplane attitude. In addition, the wing flap control must be designed to retract the flaps from the fully extended position, during steady flight at maximum continuous engine power, at all speeds below V_F+10 (mph).

(c) There must be means to indicate the takeoff, en route, approach, and landing flap positions. In addition, if any extension of the flaps beyond the landing position is possible, the flap control must be clearly marked to identify this range of extension.

[Revision note: Based on § 4b.323]

§ 25.439 Wing flap interconnection.

(a) The motion of wing flaps on opposite sides of the plane of symmetry must be synchronized by a mechanical interconnection unless it is shown that the airplane has safe flight characteristics with the flaps retracted on one side and extended on the other. If a mechanical interconnection is used, there must be means to prevent hazardous unsymmetrical operation of the wing flaps after any reasonably possible single failure of the flap actuating system.

(b) If a wing flap interconnection is used, it must be designed to account for the applicable unsymmetrical loads, including those resulting from flight with the engines on one side of the plane of symmetry inoperative and the remaining engines at takeoff power. For airplanes with flaps that are not subjected to slipstream conditions, the structure must be designed for the loads imposed when the wing flaps on one side are carrying the most severe load occurring in the prescribed symmertical conditions and those on the other side are carrying not more than 80 percent of that load.

[Revision note: Based on § 4b.324]

§ 25.441 Control system stops.

(a) Each control system must have stops that positively limit the range of motion of the control surfaces. The stops must be located in the system where wear, slackness, or take-up adjustments will not adversely affect the control characteristics of the airplane because of a change in the range of surface travel. The stops must be able to withstand loads corresponding to the design conditions for the control system.

[Revision note: Based on § 4b.325]

§ 25.443 Control system locks.

There must be means to prevent damage to the control surfaces (including tabs), and to the control system, from gusts striking the airplane while it is on the ground or water. A device for this purpose that, when engaged, prevents normal operation of the control surfaces by the pilot, must—

(a) Either automatically disengage when the pilot operates the primary flight controls in a normal manner or limit the operation of the airplane so that the pilot receives unmistakable warning at the start of takeoff; and

(b) Have means to preclude the possibility of it becoming inadvertently engaged in flight.

[Revision note: Based on § 4b.326]

§ 25.445 Proof of strength (static tests).

Compliance with limit load requirements must be shown by tests. The direction of the test loads must produce the most severe loading of the control system. The testing must include all fittings, pulleys, and brackets, used to attach the control system to the primary structure. Analyses or individual load tests must be made to show compliance with the multiplying factor of safety requirements specified for control system joints subjected to angular motion.

[Revision note: Based on § 4b.327]

§ 25.447 Operation tests.

An operation test must be made for each control system by operating the controls from the pilot compartment with the entire system loaded to correspond to 80 percent of the limit load specified for the control system. In this test, there may be no jamming, excessive friction, or exececssive deflection.

[Revision note: Based on § 4b.328]

CONTROL SYSTEM DETAILS

§ 25.451 General.

Each part of the control system must be designed and installed in a manner that will prevent jamming, chafing, or interference, resulting from cargo, passengers, or loose objects. Special precautions must be taken in the cockpit to prevent the entry of foreign objects into places where they would jam the control systems. Provisions must be made to prevent the slapping of cables or tubes against other parts of the airplane. In addition, the requirements of §§ 25.453 and 25.455 apply to cable systems and joints.

[Revision note: Based on § 4b.329 (less (a) and (b))]

§ 25.453 Cable systems.

(a) Each cable, cable fitting, turnbuckle, splice, and pulley must be approved. Cables smaller than ⅛ inch in diameter may not be used in the aileron, elevator, or rudder systems. Cable systems must be designed so that there will be no hazardous change in cable tension throughout the range of travel under operating conditions and temperature variations.

(b) Each kind and size of pulley must correspond to the cable with which it is used. Pulleys and sprockets must have closely fitted guards to prevent the cables and chains from being displaced or fouled. Each pulley must lie in the plane passing through the cable so that the cable does not rub against the pulley flange.

(c) Fairleads must be installed so that they do not cause a change in cable direction of more than 3°.

(d) Clevis pins subject to load or motion and retained only by a cotter key may not be used in the control system.

(e) Turnbuckles attached to parts having angular motion must be installed in a manner that will positively prevent any binding throughout the range of travel.

(f) There must be provisions for visual inspection of all fairleads, pulleys, terminals and turnbuckles.

[Revision note: Based on § 4b.329(a)]

§ 25.455 Joints.

Control system joints (in push-pull systems) that are subject to angular motion, except those in ball and roller bearing systems, must have a special factor of safety of not less than 3.33 with respect to the ultimate bearing strength of the softest material used as a bearing. This factor may be reduced to 2.0 for joints in cable control systems. For ball or roller bearings, the approved ratings, including those established in MIL–HDBK–5 "Metalic Materials and Elements for Flight Vehicle Structure," may not be exceeded.

[Revision note: Combines §§ 4b.329(b) and 4b.329–6]

LANDING GEAR

§ 25.461 General.

(a) The complete airplane landing gear must meet the requirements of §§ 25.461 through 25.479.

(b) The shock absorbing elements for the main, nose, and tail wheel units must be substantiated by the tests specified in §§ 25.463 through 25.467. The shock absorbing ability of the landing gear in taxiing must be shown by the tests prescribed in § 25.155.

(c) The landing gear must withstand the tests prescribed in §§ 25.463 through 25.467.

[Revision note: Combines §§ 4b.330, 4b.331 and 4b.332 (introductory paragraph)]

§ 25.463 Shock absorption tests.

(a) It must be shown by energy absorption tests that the limit load factors selected for design in accordance with § 25.261(b) for takeoff and landing weights, respectively, will not be exceeded.

(b) The landing gear may not fail in a test, demonstrating a reserve of energy absorption, simulating an airplane descent velocity of 12 f.p.s. at design landing weight, assuming wing lift not greater than the airplane weight acting during the landing impact.

[Revision note: Based on § 4b.332(a)]

§ 25.465 Limit drop tests.

(a) If compliance with § 25.463(a) is shown by free drop tests, these tests must be made on the complete airplane, or on units consisting of a wheel, tire, and shock absorber, in their proper positions, from free drop heights not less than—

(1) 18.7 inches for the design landing weight conditions; and

(2) 6.7 inches for the design takeoff weight conditions.

(b) If wing lift is simulated in free drop tests, the landing gear must be dropped with an effective weight equal to

$$W_e = W\left(\frac{h+(1-L)d}{h+d}\right)$$

where—

W_e = the effective weight to be used in the drop test (lbs.);

h = specified free drop height (inches);

d = deflection under impact of the tire (at the approved inflation pressure) plus the vertical component of the axle travel relative to the drop mass (inches);

$W = W_M$ for main gear units (lbs.), equal to the static weight on that unit with the airplane in the level attitude (with the nose wheel clear in the case of nose wheel type airplanes);

$W = W_T$ for tail gear units (lbs.), equal to the static weight on the tail unit with the airplane in the tail-down attitude;

$W = W_N$ for nose wheel units (lbs.), equal to the vertical component of the static reaction that would exist at the nose wheel, assuming that the mass of the airplane acts at the center of gravity and exerts a force of $1.0g$ downward and $0.25g$ forward; and

L = the ratio of the assumed wing lift to the airplane weight, but not more than 1.0.

(c) The attitude in which a landing gear unit is drop tested must simulate the critical airplane landing conditions for the unit.

(d) The value of d used in the computation of W_e in paragraph (b) of this section may not exceed the value actually obtained in the drop test.

[Revision note: Based on § 4b.332(b)]

§ 25.467 Reserve energy absorption drop tests.

(a) If compliance with the reserve energy absorption condition specified in § 25.463(b) is shown by free drop tests, the landing gear units must be dropped from a free drop height of not less than 27 inches.

(b) If wing lift equal to the airplane weight is simulated, the units must be dropped with an effective mass equal to $W_e = W\left(\frac{h}{h+d}\right)$ where the symbols and other details are the same as in § 25.465(b).

[Revision note: Based on § 4b.332 (less introductory paragraph, (a) and (b))]

§ 25.469 Limit load factor determination.

(a) In determining the airplane inertia limit load factor n from the free drop tests specified in §§ 25.461 through 25.467, the following formula must be used:

$$n = n_j \frac{W_e}{W} + L$$

where—

n_j = the load factor during impact developed on the mass used in the drop test (that is, the acceleration dv/dt in g's recorded in the drop test plus 1.0); and

W_e, W, and L are the same as in § 25.465(b).

(b) The value of n determined in paragraph (a) of this section may not be greater than the limit load factor used for the landing conditions.

[Revision note: Based on § 4b.333]

§ 25.471 Retracting mechanism.

(a) *General.* (1) The landing gear retracting mechanism, wheel well doors, and supporting structure, must be designed for—

(i) The loads occurring in the flight conditions when the gear is in the retracted position;

(ii) The combination of friction, inertia, brake torque, and air loads, occurring during retraction and extension at any airspeed up to 1.6 V_{S_1} (with the flaps in the approach position at design landing weight); and

(iii) Any load factor up to those specified in § 25.213 for the flaps extended condition.

(2) Unless there are other means to decelerate the airplane in flight at this speed, the landing gear, the retracting mechanism, and the airplane structure (including wheel well doors) must be designed to withstand the flight loads occurring with the landing gear in the extended position at any speed up to 0.67 V_C.

(3) Landing gear doors, their operating mechanism, and their supporting structures must be designed for the yawing maneuvers prescribed for the airplane in addition to the conditions of airspeed and load factor prescribed in subparagraphs (1) and (2) of this paragraph.

(b) *Landing gear lock.* The airplane must have—

(1) A positive means to maintain the landing gear in the extended position; and

(2) A means to prevent the retraction of the landing gear while the airplane is on the ground.

(c) *Emergency operation.* There must be an emergency means for extending the landing gear in the event of any reasonably probable failure in the normal retraction system. This emergency means must be designed so that the landing gear can be extended after failure of any single source of hydraulic, electric, or equivalent energy supply.

(d) *Operation test.* The proper functioning of the landing gear retracting mechanism must be shown by operation tests.

(e) *Position indicator and warning device.*

(1) If a retractable landing gear is used, there must be a landing gear position indicator (as well as necessary switches to actuate the indicator) or other means to inform the pilot that the gear is secured in the extended (or retracted) position.

(2) If switches are used, they must be located and coupled to the landing gear mechanical systems in a manner that precludes the possibility of an erroneous indication of "down and locked" if the landing gear is not in a fully extended position, or of "up and locked" if the landing gear is not in the fully retracted position. The switches may be located where they are operated by the actual landing gear locking latch or device.

(3) In addition to the requirement of subparagraphs (1) and (2) of this paragraph, landplanes must have an aural warning device that will function continuously when one or more throttles are closed, if the landing gear is not fully extended and locked.

(4) If there is a manual shutoff for the warning device prescribed in subparagraph (3) of this paragraph, it must be installed so that reopening the throttles will reset the warning mechanism.

(5) In addition to the requirements of subparagraphs (1) through (4) of this paragraph, landplanes must have an aural warning device that will function continuously, when the wing flaps are extended beyond the maximum approach position determined under § 25.51(e), if the gear is not fully extended and locked. There may not be a manual shutoff for this warning device. The flap position sensing unit may be installed at any suitable location. The system for this device may use any part of the system (including the aural warning device) for the device required in subparagraph (3) of this paragraph.

(f) *Controls.* The landing gear retraction control must be located and operate in accordance with the provision of § 25.507.

(g) *Protection of equipment in wheel wells.* Equipment that is essential to safe operation of the airplane and that is located in wheel wells must be protected from the damaging effects of—

(1) A bursting tire, unless it is shown that a tire cannot burst from overheat; and

(2) A loose tire tread, unless it is shown that a loose tire tread cannot cause damage.

[Revision note: Combines §§ 4b.334 and 4b.334-2]

§ 25.473 Wheels.

Each main wheel and nose wheel must be approved. In addition, the following provisions apply:

(a) The maximum static load rating of each main wheel and nose wheel may not be less than the corresponding static ground reaction under the design takeoff weight of the airplane and the critical center of gravity position.

(b) The maximum limit load rating of each main wheel and nose wheel may not be less than the maximum radial limit load determined in accordance with the applicable ground load requirements of this part.

(c) The brake kinetic energy capacity rating of each main wheel-brake assembly may not be less than the kinetic energy absorption requirements determined in accordance with the requirements of subparagraph (1) or (2) of this paragraph.

(1) The brake kinetic energy absorption requirements must be based on a rational analysis of the sequence of events that are expected to occur during operational landings at maximum landing weight. This analysis must include conservative values of airplane speed at which the brakes are applied, braking coefficient of friction between tires and runway, aerodynamic drag, propeller drag or powerplant forward thrust, and, if more critical, the most adverse single engine or propeller malfunction.

(2) Instead of a rational analysis, the kinetic energy absorption requirements for each main wheel brake assembly may be derived from the following formula, which assumes an equal distribution of braking between main wheels:

$$KE = \frac{0.0334 W V_{S_0}^2}{N}$$

where—

KE = kinetic energy per wheel (ft.-lb.);

W = design landing weight (lb.);

V_{S_0} = power-off stalling speed of the airplane (mph) at sea level, at the design landing weight, and in the landing configuration; and

N = number of main wheels.

The formula must be modified in cases of unequal braking distribution.

(d) The minimum stalling speed rating of each main wheel-brake assembly (that is, the initial speed used in the dynamometer tests) may not be more than the V_{S_0} used in the determination of kinetic energy in accordance with paragraph (c) of this section, assuming that the test procedures for wheel-brake assemblies involve a specified rate of deceleration, and, therefore, for the same amount of kinetic energy, the rate of energy absorption (the power absorbing ability of the brake) varies inversely with the initial speed.

[Revision note: Based on § 4b.335]

§ 25.475 Tires.

Each landing gear tire must properly fit on the rim of the wheel and must have a load rating that is not exceeded under the following loads:

(a) Equal static loads, corresponding to the most critical combination of maximum takeoff weight and center of gravity position, on all main wheel tires.

(b) Equal loads on all nose wheel tires corresponding to the following ground reactions:

(1) The static ground reaction for the tire with the most critical combination of takeoff weight and center of gravity position. This load must equal the static rating of the tire.

(2) The dynamic ground reaction for the tire at maximum landing weight, assuming that the mass of the airplane is concentrated at the most critical location of the center of gravity for this weight and is exerting a force of $1.0g$ downward and $0.31g$ forward with the reactions being distributed to the nose and main wheels by the principles of statics and with a $0.31g$ drag reaction at the ground applied at each wheel with brakes. This load must equal the dynamic rating of the tire.

(3) The dynamic ground reaction for the tire at design takeoff weight, assuming that the mass of the airplane is concentrated at the most critical location of the center of gravity for this weight and is exerting a force of $1.0g$ downward and $0.20g$ forward. The reactions in this case are distributed to the nose and main wheels by the principles of statics and a $0.20g$ drag reaction at the ground is applied at each wheel with brakes. This load must equal the dynamic rating of the tire.

[Revision note: Based on § 4b.336]

§ 25.477 Brakes.

(a) Each brake must be approved. Brake ratings are determined in accordance with § 25.473 (c) and (d).

(b) The brake system must be designed and constructed so that if any connecting or transmitting element (excluding the operating pedal or handle) fails, or any single source of hydraulic or other brake operating energy supply is lost, it is possible to bring the airplane to rest under conditions specified in § 25.55, with a mean deceleration during the landing roll of at least 50 percent of that obtained in determining the landing distance as prescribed in that section. Unless it is shown that the leakage of hydraulic fluid resulting from failure of the sealing elements in hydraulic brakes, the brake drum, shoes, and actuators, (or their equivalents) does not reduce the braking effectiveness below that required by this paragraph, these units are considered to be connecting or transmitting elements.

(c) Brake controls may not require excessive control force in their operation.

(d) The airplane must have a parking control that, when set by the pilot, will without further attention maintain sufficient braking to prevent the airplane from rolling on a paved, level runway while takeoff power on the critical engine is being applied.

(e) If antiskid devices are installed, the devices and associated systems must be designed so that no single probable malfunction will result in a hazardous loss of braking ability or directional control of the airplane. Antiskid devices meeting the airworthiness portions of Military Specification MIL–B–8075 (ASG) and any amendments thereto, are acceptable.

[Revision note: Combines § 4b.337 and first sentence of § 4b.337–4]

§ 25.479 Skis.

Each ski must be approved. The maximum limit load rating of the ski may not be less than the maximum limit load determined under the applicable ground load requirements of this Part.

[Revision note: Based on § 4b.338]

Floats and Hulls

§ 25.491 Floats.

Each main float of a seaplane or amphibian must be approved and must conform to the provisions of § 25.311. In addition, each seaplane or amphibian main float must have—

(1) A buoyancy of 80 percent in excess of that required to support the maximum weight of the seaplane in fresh water; and

(2) Not less than five water tight compartments of approximately equal volumes.

[Revision note: Based on § 4b.341]

§ 25.493 Hulls.

(a) Each hull seaplane or hull amphibian must be divided into enough watertight compartments so that, with any two adjacent compartments flooded, the buoyancy of the hull and auxiliary floats (and wheel tires, if used) will provide a sufficient margin of positive stability to minimize the probability of capsizing in rough, fresh water.

(b) Bulkheads with watertight doors may be used for communication between compartments.

[Revision note: Based on § 4b.342]

Personnel and Cargo Accommodations

§ 25.501 Pilot compartment.

(a) The pilot compartment and its equipment must provide a satisfactory degree of safety and assurance that the minimum flight crew (established in accordance with § 25.1169) will be able to perform all of their duties, and to operate the controls in the correct manner, without unreasonable concentration and fatigue.

(b) The primary flight controls listed in § 25.509(a), excluding cables and control rods, must be located with respect to the propellers so that no member of the minimum flight crew (established in accordance with § 25.1169), or part of the controls, lies in the region between the plane of rotation of any inboard propeller and the surface generated by a line passing through the center of the propeller hub making an angle of 5° forward or aft of the plane of rotation of the propeller.

(c) If provision is made for a second pilot, the airplane must be controllable with equal safety from either seat.

(d) The pilot compartment must be constructed so that, when flying in rain or snow, it will not leak in a manner that will distract the crew or harm the structure.

(e) The airplane must have a door, between the passenger and pilot compartments, that has a locking means to prevent passengers from opening it without the pilot's permission.

(f) Vibration and noise characteristics of cockpit equipment may not interfere with safe operation of the airplane.

[Revision note: Based on § 4b.350]

§ 25.503 Pilot compartment visibility.

(a) The pilot compartment must be arranged to afford a sufficiently extensive, clear, and undistorted view, during nonprecipitation conditions, to enable the pilots to safely perform all maneuvers within the operating limitations of the airplane, including taxiing, takeoff, approach, and landing. In addition, it must be shown by day and night flight tests, that under nonprecipitation conditions the pilot compartment is free of glare and reflections that would tend to interfere with the normal duties of the minimum flight crew (established in accordance with § 25.1169).

(b) The airplane must have a means to maintain a clear portion of the windshield, during precipitation conditions, sufficient for both pilots to have a sufficiently extensive view along the flight path in all normal flight attitudes of the airplane. This means must be designed to function, without continuous attention on the part of the crew, in—

(1) Heavy rain at speeds up to 1.6 V_{S_1}, with flaps retracted; and

(2) The most severe icing conditions for which certification of the airplane is requested.

(c) In addition to the requirements of paragraph (b) of this section, there must be at least one window for the pilot in command that, when the cabin is not pressurized, is openable under the conditions prescribed in paragraph (b) of this section, and that provides the view specified in that paragraph. It must be designed so that, when the window is opened, there is sufficient protection from the elements against impairment of the pilot's vision.

[Revision note: Based on § 4b.351]

§ 25.505 Windshields and windows.

(a) Nonsplintering safety glass must be used for all internal glass panes.

(b) Windshield panes that are directly in front of the pilots in the normal conduct of their duties, and the supporting structures for these panes, must withstand without penetration the impact of a four-pound bird when the velocity of the airplane (relative to the bird along the airplane's flight path) is equal to the value of V_C, at sea level, selected in accordance with § 25.203(d).

(c) Unless it can be shown by analysis or tests that the probability of occurrence of a critical windshield fragmentation condition is of a low order, the airplane must have a means to minimize the danger to the pilots from flying windshield fragments due to bird impact. The provisions of this paragraph apply to all transparent panes in the cockpit that—

(1) Appear in the front view of the airplane;

(2) Are inclined 15 degrees or more to the longitudinal axis of the airplane; and

(3) Have any part of the pane located where its fragmentation will constitute a hazard to the pilots.

(d) The design of windshields and windows in pressurized airplanes must be based on factors peculiar to high altitude operation, including the effects of continuous and cycling pressurization loadings, the inherent characteristics of the material used, and the effects of temperatures and temperature differentials. The windshield and window panels must be strong enough to withstand the maximum cabin pressure differential loads combined with critical aerodynamic pressure and temperature effects, after failure of any load-carrying element of the windshield or window. It may be assumed that, after a single failure that is obvious to the flight crew (established in accordance with § 25.1169), the cabin pressure differential will be reduced from the maximum, in accordance with appropriate operating limitations, to enable continued safe flight of the airplane with a cabin pressure altitude of not more than 15,000 feet.

[Revision note: Based on § 4b.352]

§ 25.507 Cockpit controls.

(a) All cockpit controls must be located to provide convenience in operation and to prevent confusion and inadvertent operation.

(b) The direction of movement of cockpit controls must conform to the requirements of § 25.509. Wherever practicable, the sense of motion involved in the operation of other controls must correspond to the sense of the effect of the operation upon the airplane or upon the part operated. All controls of a variable nature using a rotary motion must move clockwise from the off position, through an increasing range, to the full on position.

(c) The controls must be located and arranged, with respect to the pilots' seats, so that there is full and unrestricted movement of each control without interference from either the cockpit structure or the clothing of the minimum flight crew (established in accordance with § 25.1169) when any member of this flight crew is seated with the seat belt fastened. This must be shown for persons ranging from 5′2″ to 6′0″ in height.

(d) Identical powerplant controls for each engine must be located in positions that prevent confusion as to the engines they control.

(e) Wing flap controls and auxiliary lift device controls must be located on top of the pedestal, aft of the throttle(s), centrally or to the right of the pedestal centerline, and not less than 10 inches aft of the landing gear control.

(f) The landing gear control must be located forward of the throttles and must be operable by each of the pilots when seated with seat belts fastened.

(g) Control knobs must be shaped in accordance with § 25.511. In addition, the knobs must be of the same color, and this color must contrast with the color of the other control knobs and the surrounding cockpit.

(h) If a flight engineer is required as part of the minimum flight crew (established in accordance with § 25.1169), the airplane must have a flight engineer station located and arranged so that the flight crew members can perform their functions efficiently and without interfering with each other.

[Revision note: Based on § 4b.353]

§ 25.509 Sense of motion for cockpit controls.

Cockpit controls must be designed so that they operate in accordance with the following movement and actuation:

(a) Aerodynamic controls:

(1) *Primary.*

Controls	*Movement and actuation*
Aileron	Right (clockwise) for right wing down.
Elevator	Rearward for nose up.
Rudder	Right pedal forward for nose right.

(2) *Secondary.*

Controls	*Movement and actuation*
Flaps (or auxiliary lift devices).	Forward for flaps up; rearward for flaps down.
Trim tabs (or equivalent).	Rotate to produce similar rotation of the airplane about an axis parallel to the axis of the control.

(b) Powerplant and auxiliary controls:

(1) *Powerplant.*

Controls	*Movement and actuation*
Throttles	Forward to increase forward thrust and rearward to increase rearward thrust.
Propellers	Forward to increase rpm.
Mixture	Forward or upward for rich.
Carburetor air heat.	Forward or upward for cold.
Supercharger.	Forward or upward for low blower. For turbosuperchargers, forward, upward, or clockwise, to increase pressure.

(2) *Auxiliary.*

Controls	*Movement and actuation*
Landing gear	Down to extend.

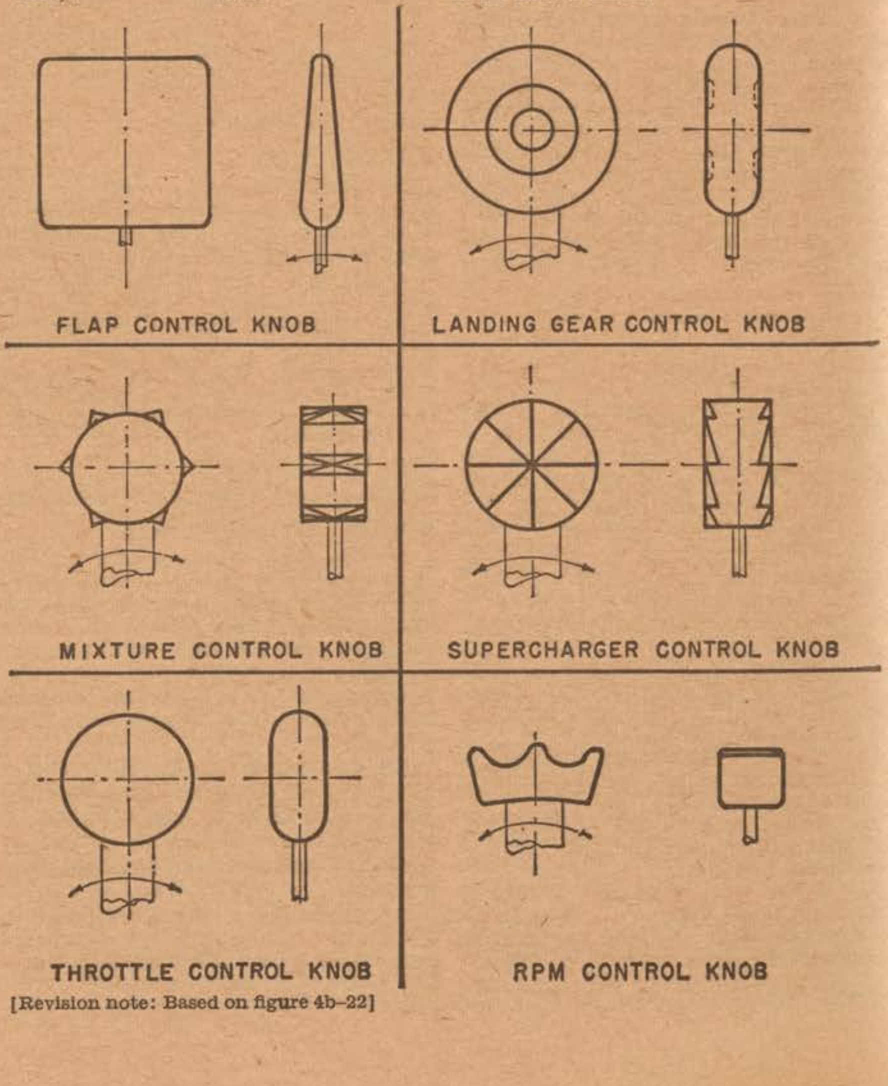
[Revision note: Combines figures 4b–16 and 4b–17]

§ 25.511 Cockpit control knob shape.

Cockpit control knob shapes must conform to the following figures:

ILLUSTRATION OF COCKPIT CONTROL KNOB SHAPES

This figure indicates general shape only and not the exact size or specific proportions of the control knobs.



[Revision note: Based on figure 4b–22]

§ 25.517 Doors.

(a) Airplane cabins must have at least one easily accessible external door.

(b) There must be a means to lock and safeguard all external doors against opening in flight (either inadvertently by persons or as a result of mechanical failure). Except for cargo and service doors not suitable for use as an exit in an emergency, all external doors must be openable from both the inside and the outside, even though persons may be crowded against the door on the inside of the airplane. Inward opening doors may be used if there are means to prevent occupants from crowding against the door to an extent that would interfere with the opening of the door. The means of opening must be simple and obvious and must be arranged and marked so that it can be readily located and operated, even in darkness. Auxiliary locking devices may be used.

(c) Except for cargo and service doors not suitable for use as an exit in an emergency, all external doors must be reasonably free from jamming as a result of fuselage deformation in a minor crash.

(d) Except for cargo and service doors not suitable for use as an exit in an emergency, all external doors must be located where persons using them will not be endangered by the propellers when appropriate operating procedures are used.

(e) The airplane must have a provision for direct visual inspection of the locking mechanism by crewmembers to ascertain whether all external doors, for which the initial opening movement is outward (including passenger, crew, service, and cargo doors), are fully locked. In addition, there must be a visual means to signal to appropriate crewmembers that all normally used external doors are closed and in the fully locked position.

[Revision note: Combines § 4b.356, last sentence of § 4b.356–1, and first sentence of § 4b.356–2(a)]

§ 25.519 Seats, berths, safety belts, and harnesses.

(a) The seats, berths, safety belts, harnesses, and adjacent parts of the airplane at all stations designated as occupiable during takeoff and landing, must be designed so that a person making proper use of these facilities will not suffer serious injury in the emergency landing conditions, as a result of the inertia forces specified in § 25.331. Seats and berths must be approved.

(b) (1) Passengers and crew must be protected from head injury by—

(i) A safety belt and shoulder harness that will prevent the head from contacting any injurious object;

(ii) A safety belt and the elimination of all injurious objects within striking radius of the head; or

(iii) A safety belt and a cushioned rest that will support the arms, shoulders, head, and spine.

(2) If the seat backs do not have a firm hand hold, there must be a hand grip or rail along the aisles to enable passengers or crewmembers to steady themselves while using the aisles in moderately rough air.

(3) All projecting objects which would cause injury to persons seated or moving about the airplane in normal flight must be padded.

(4) Berths must be designed so that the forward portion has a padded end board, canvas diaphragm, or an equivalent means, that is able to withstand the static load reaction of the occupant when subjected to the forward inertia force specified in § 25.331. Berths must be free from corners and protuberances likely to cause serious injury to a person occupying the berth during emergency conditions.

(5) Each crewmember seat at flight deck stations must have provisions for use of a shoulder harness. Seats with these provisions must meet the strength requirements of paragraph (c) of this section.

(6) Cabin attendant seats must be in the passenger compartment near approved floor level emergency exists.

(c) (1) All seats, berths, and their supporting structures, must be designed for an occupant weight of 170 pounds, considering the maximum load factors, inertia forces, and reactions between the occupant, seat, and safety belt or harness, at all relevant flight and ground load conditions (including the emergency landing conditions prescribed in § 25.331). For berths, the forward inertia force must be considered in accordance with paragraph (b)(4) of this section and need not be considered with respect to the safety belt.

(2) In the structural analysis and testing of the seats, berths, and their supporting structures, it may be assumed that the critical load in the forward, sideward, downward, and rearward directions (as determined from the prescribed flight, ground, and emergency landing conditions) acts separately. Selected combinations of loads may be used if the required strength in all specified directions is substantiated.

(3) Pilot seats must be designed for the reactions resulting from the application of pilot forces to the flight controls, as prescribed in § 25.249.

(4) In determining the strength of the seat or berth attachments to the structure, and of the safety belt or shoulder harness attachments to the seat, berth, or structure, the inertia forces specified in § 25.331(a) must be multiplied by a factor of 1.33 instead of the fitting factor prescribed in § 25.311.

[Revision note: Combines §§ 4b.358 and 2d and 3d sentences of 4b.358–1]

§ 25.521 Cargo and baggage compartments.

(a) Each cargo and baggage compartment must be designed for the placarded maximum weight of contents and the critical load distributions at the appropriate maximum load factors, at all specified flight and ground load conditions, except the emergency landing conditions of § 25.331.

(b) The airplane must have means to prevent the contents in the compartments from becoming a hazard by shifting, under the loads specified in paragraph (a) of this section.

(c) The airplane must have means to protect the passengers and crew from injury by the contents of any compartment, under the emergency landing conditions of § 25.331.

[Revision note: Based on § 4b.359]

EMERGENCY PROVISIONS

§ 25.531 Ditching certification.

(a) If the airplane is to be certificated with ditching provisions, it must conform to the requirements of this section and §§ 25.541, 25.1061(a), and 25.1063. The recommended ditching procedures established on the basis of these requirements must be recorded in the Airplane Flight Manual.

(b) All practicable design measures, compatible with the general characteristics of the type airplane, must be taken to minimize the probability that in an emergency landing on water, the behavior of the airplane would cause immediate injury to the occupants or would make it impossible for them to escape. The probable behavior of the airplane in a water landing must be investigated by model tests or by comparison with airplanes of similar configuration for which the ditching characteristics are known. Scoops, flaps, projections, and all other factors likely to affect the hydrodynamic characteristics of the actual airplane, must be considered.

(c) It must be shown that, under reasonably probable water conditions, the flotation time and trim of the airplane will allow all occupants to leave the airplane and enter the life rafts required by § 25.1061. If compliance with this provision is shown by buoyancy and trim computations, appropriate allowances must be made for probable structural damage and leakage. If the airplane has fuel tanks (with fuel jettisoning provisions) that can reasonably be expected to withstand a ditching without leakage, the jettisonable volume of fuel may be considered as buoyancy volume.

(d) Unless the effects of the collapse of external doors and windows are taken into account in the investigation of the probable behavior of the airplane in a water landing (as prescribed in paragraphs (b) and (c) of this section), the external doors and windows must be designed to withstand the probable maximum local pressures.

[Revision note: Based on § 4b.361]

§ 25.533 Emergency evacuation.

(a) Crew and passenger areas must have emergency means to allow rapid evacuation in the event of crash landings, with the landing gear extended or retracted, taking into account the possibility of the airplane being on fire. If the airplane is divided into separate compartments without the minimum unobstructed passageway between compartments required by § 25.547, this section and §§ 25.535 through 25.549 apply to each compartment independently.

(b) Passenger and crew access doors and service doors meeting the requirements of this section and §§ 25.535

through 25.547 are considered to be emergency exits.

[Revision note: Based on § 4b.362 (introductory paragraph)]

§ 25.535 Flight crew emergency exits.

(a) Flight crew emergency exits must be in the flight crew area. There must be either one exit on each side of the airplane or a top hatch.

(b) The exit (or exits) must be of sufficient size and must be located so as to allow rapid evacuation of the crew. An exit size and shape of other than at least 19 by 20 inches unobstructed rectangular opening may be used only if exit utility is satisfactorily shown, by a typical flight crewmember, to the Administrator.

(c) For airplanes with a passenger capacity of 20 or less, if the Administrator finds that the proximity of passenger emergency exits to the flight crew area offers a convenient and readily accessible means of evacuation for the flight crew, the exit requirements of paragraphs (a) and (b) of this section do not apply.

[Revision note: Combined §§ 4b.362(a) and 4b.362-1(a)]

§ 25.537 Passenger emergency exits; type and location.

(a) All required passenger emergency exits must be accessible to the passengers and located where they will afford the most effective means of passenger evacuation. Openings larger than those specified in this section, whether or not of rectangular shape, may be used if—

(1) The specified rectangular opening can be inscribed within the opening; and

(2) The base of the inscribed rectangular opening meets the specified step-up and step-down heights.

(b) The type of exit and its general location must be as follows:

(1) Type I: A rectangular opening of not less than 24 inches wide by 48 inches high, with corner radii not greater than ⅓ the width of the exit. The first Type I exit on each side of the fuselage must be in the rearward part of the passenger compartment unless another location affords a more effective means of passenger evacuation. All Type I exits must be floor level exits.

(2) Type II: A rectangular opening of not less than 20 inches wide by 44 inches high, with corner radii not greater than ⅓ the width of the exit. Unless Type I exits are required, one Type II exit on each side of the fuselage must be in the rearward part of the passenger compartment unless another location affords a more effective means of passenger evacuation. Type II exits must be floor level exits unless located over the wing, in which case they may not have a step-up inside the airplane of more than 10 inches nor a step-down outside the airplane of more than 17 inches.

(3) Type III: A rectangular opening of not less than 20 inches wide by 36 inches high, with corner radii not greater than ⅓ the width of the exit, located over the wing, with a step-up inside the airplane of not more than 20 inches and a step-down outside the airplane of not more than 27 inches.

(4) Type IV: A rectangular opening of not less than 19 inches wide by 26 inches high, with corner radii not greater than ⅓ the width of the exit, located over the wing, with a step-up inside the airplane of not more than 29 inches and a step-down outside the airplane of not more than 36 inches.

(c) Step-down distance as used in this section means the actual distance between the bottom of the required opening and a usable foothold, extending out from the fuselage, that is large enough to be effective without searching visually or by feel.

[Revision note: Combines §§ 4b.362(b) and 4b.362-2]

§ 25.539 Passenger emergency exits; number required.

(a) The exits prescribed are for each side of the fuselage. The exits need not be diametrically opposite each other. The relation between the passenger seating capacity and the type and number of exits required on each side of the airplane is as follows:

(1)

Passenger seating capacity	Emergency exits required on each side of the fuselage			
	Type I	Type II	Type III	Type IV
1 to 10 inclusive				1
11 to 19 inclusive			1	
20 to 39 inclusive		1		1
40 to 59 inclusive	1			1
60 to 79 inclusive	1		1	
80 to 109 inclusive	1		1	1
110 to 139 inclusive	2		1	
140 to 179 inclusive	2		2	
180 to 219 inclusive	2	2		

(2) Two Type IV exits may be installed instead of each required Type III exit.

(3) Additional exits, providing an effective means of passenger evacuation consistent with the minimum number prescribed in subparagraph (1) of this paragraph, are required for airplanes with a passenger capacity of 220 or more.

(b) If the Administrator finds that there are additional emergency evacuation means on the airplane, the passenger/emergency exit relationship may be increased by not more than 10 passengers beyond the limits specified in paragraph (a)(1) of this section. If an approved inflatable slide is installed at each floor level exit (other than over-the-wing exits), the passenger/emergency exit relationship may be increased by—

(1) Not more than five passengers on airplanes with at least two of these exits; and

(2) Not more than 10 passengers on airplanes with at least four of these exits.

(c) For airplanes on which the vertical location of the wing does not allow the installation of over-the-wing exits, an exit, the dimensions of which may not be less than those prescribed in § 25.537(b)(3), must be installed instead of each Type III and each Type IV exit required by subparagraph (a)(1) of this section.

[Revision note: Combines §§ 4b.362(c) and 4b.362-3 (less (a))]

§ 25.541 Ditching emergency exits.

(a) In addition to the requirements of § 25.539, airplanes to be certificated with ditching provisions must have at least two exits, both located above the waterline and one on each side of the airplane, meeting the minimum dimensions of—

(1) A Type IV exit for airplanes with a passenger seating capacity of 10 or less; and

(2) A Type III exit for airplanes with a passenger seating capacity of more than 10.

(b) In addition to the requirements of paragraph (a) of this section, there must be at least one emergency exit, located above the waterline, for each unit (or part of a unit) of 35 passengers. If side exits cannot be above the waterline, the side exits must be replaced by an equal number of overhead hatches of not less than the dimensions of a Type III exit except that, for airplanes with a passenger capacity of 35 or less, the two required Type III side exits need be replaced by only one overhead hatch.

(c) Two Type IV exits may be installed instead of each required Type III exit.

[Revision note: Based on § 4b.362(d)]

§ 25.543 Emergency exit arrangement.

(a) Emergency exits, including flight crew emergency exits, are movable doors and hatches in the external walls of the fuselage allowing unobstructed openings to the outside.

(b) The means for opening emergency exists must be simple and obvious and may not require exceptional effort. Internal exit-opening means involving sequence operations (such as operation of two handles or latches or the release of safety catches) may be used in flight crew emergency exits if it can be reasonably established that these means are simple and obvious to crewmembers trained in their use. All emergency exits must be openable from both the inside and the outside except that sliding window emergency exits in the flight crew area need not be openable from the outside if the Administrator finds that other approved exits are convenient and readily accessible to the flight crew area.

(c) There must be a means to lock each emergency exit and to safeguard against its opening in flight, either inadvertently by persons or as a result of mechanical failure. In addition, there must be a means for direct visual inspection of the locking mechanism by crewmembers to ascertain that all emergency exists for which the initial opening movement is outward are fully locked.

(d) There must be provisions to minimize the probability of jamming of the emergency exits resulting from fuselage deformation in a minor crash landing.

(e) All landplane emergency exits (other than exits located over the wing) that are more than six feet from the ground with the airplane on the ground and the landing gear extended, must have an approved means to assist the occupants in descending to the ground.

The assist device for crew exits may be a rope or any other device demonstrated to be suitable for the purpose. The assist device for passenger exits may be an inflatable slide, a noninflatable slide, or other approved device. Ropes and ladders may not be used at passenger floor level exits.

(f) The proper functioning of emergency exit installations must be demonstrated by tests.

[Revision note: Combines §§ 4b.362(e), 4b.362-1 (less (a)), and 4b.362-4]

§ 25.545 Emergency exit marking.

(a) Each emergency exit, its means of access, and its means of opening, must be conspicuously marked. The identity and location of emergency exits must be recognizable from a distance equal to the width of the cabin. The location of the emergency exit operating handle and the instructions for opening must be marked on or adjacent to the emergency exit and must be readable from a distance of 30 inches.

(b) Exits marked as emergency exits, though in excess of the required number of emergency exits, must meet all the requirements for emergency exits of the particular type. Emergency exits customarily used in entering or leaving the airplane need only be marked with the word "EXIT". A source of light with an energy supply independent of the main lighting system, must be installed to illuminate all passenger emergency exit markings. These lights must be designed to function automatically in a crash landing and must also be operable manually.

(c) Each emergency exit that is required to be openable from the outside, and its means of opening, must be marked on the outside of the airplane for guidance of rescue personnel.

[Revision note: Combines §§ 4b.362(f), 4b.362-1 (less (a)), and 4b.362-5 (less (c))]

§ 25.547 Emergency exit access.

(a) Except as provided in § 25.533(a) with regard to passageways between individual compartments, passageways between individual compartments of the passenger area, and passageways leading to Type I and Type II emergency exits, must be at least 20 inches wide and may not be obstructed.

(b) Adjacent to an emergency exit where assisting means are required by § 25.543(e) there must be sufficient additional space to allow a crewmember to assist in the evacuation of passengers without reduction in the unobstructed width of the passageway to this exit.

(c) There must be access from the main aisle to all Type III and Type IV exits. The access may not be obstructed by seats, berths, or other protrusions, to an extent that would reduce the effectiveness of the exit. However, there may be minor obstructions if the Administrator finds that there are compensating factors to maintain the effectiveness of the exit. If it is necessary to pass through a doorway to reach any required emergency exit from any seat in the passenger cabin, the door must have a means to latch it in the open position. A suitable placard, stating that the door is to be latched in the open position during takeoff and landing, must be installed.

[Revision note: Based on § 4b.362(g)]

§ 25.549 Width of main aisle.

The main passenger aisle width at any point between seats may not be less than the values in the following table:

Passenger seating capacity	Minimum main passenger aisle width	
	Less than 25 inches from floor	25 inches and more from floor
	Inches	*Inches*
10 or less	12	18
11 to 19	12	20
20 or more	15	20

[Revision note: Based on § 4b.363 (less introductory paragraph and (a) through (g))]

VENTILATION, HEATING, AND PRESSURIZATION

§ 25.561 Ventilation.

(a) All crew compartments must be ventilated with enough fresh air to enable the crewmembers to perform their duties without undue discomfort or fatigue. An outside air supply of approximately 10 cubic feet per minute is the minimum for each crewmember.

(b) Ventilating air in crew and passenger compartments must be free of harmful or hazardous concentrations of gases or vapors. Carbon monoxide concentrations in excess of one part in 20,000 parts of air are considered hazardous. Carbon dioxide in excess of three percent by volume (sea level equivalent) is considered hazardous in the case of crewmembers. Higher concentrations of carbon dioxide may be allowed in crew compartments if appropriate protective breathing equipment is available. Any acceptable carbon monoxide detection method may be used to show freedom from harmful or hazardous concentrations of carbon monoxide.

(c) There must be provisions made to ensure that the conditions prescribed in paragraph (b) of this section are met after reasonably probable failures or malfunctioning of the ventilating, heating, pressurization, or other systems and equipment. If accumulation of hazardous quantities of smoke in the cockpit area is reasonably probable, smoke evacuation must be readily accomplished, starting with full pressurization and without depressurizing beyond safe limits.

(d) There must be a means to enable the crew to control the temperature and quantity of ventilating air supplied to the crew compartment, independently of the temperature and quantity of ventilating air supplied to other compartments.

[Revision note: Combines §§ 4b.371 and 4b.371-1]

§ 25.563 Heating systems.

Combustion heaters must be approved and must conform to the fire protection requirements of § 25.593. Engine exhaust heaters must conform to the provisions of §§ 25.825 and 25.827.

[Revision note: Based on § 4b.372]

§ 25.567 Pressurized cabins.

Pressurized cabins and compartments that will be occupied must be equipped to provide a cabin pressure altitude of not more than 8,000 feet at the maximum operating altitude of the airplane under normal operating conditions. If the airplane is certificated for operation at altitudes over 25,000 feet, it must be able to maintain a cabin pressure altitude of not more than 15,000 feet in the event of any reasonably probable failure, or malfunction, in the pressurization system.

[Revision note: Based on § 4b.374]

§ 25.569 Pressure control for pressurized cabins.

Pressurized cabins must have at least the following valves, controls, and indicators, for controlling cabin pressure:

(a) Two pressure relief valves (at least one of which is the normal regulating valve) to automatically limit the positive pressure differential to a predetermined value at the maximum rate of flow delivered by the pressure source. The combined capacity of the relief valves must be large enough so that the failure of any one valve would not cause an appreciable rise in the pressure differential. The pressure differential is positive when the internal pressure is greater than the external.

(b) Two reverse pressure differential relief valves (or their equivalents) to automatically prevent a negative pressure differential that would damage the structure. One valve is enough, however, if it is of a design that reasonably precludes its malfunctioning.

(c) A means by which the pressure differential can be rapidly equalized.

(d) An automatic or manual regulator for controlling the intake or exhaust airflow, or both, for maintaining the required internal pressures and airflow rates.

(e) Instruments at the pilot or flight engineer station to show the pressure differential, the absolute pressure in the cabin, and the rate of change of the absolute pressure.

(f) Warning indication at the pilot or flight engineer station to indicate when the safe or preset limits on pressure differential and on absolute cabin pressure are exceeded. Appropriate warning markings on the cabin pressure differential indicator meet the warning requirement for pressure differential limits and an aural or visual signal (in addition to cabin altitude indicating means) meets the warning requirement for absolute cabin pressure limits.

(g) A warning placard at the pilot or flight engineer station if the structure is not designed for pressure differentials up to the maximum relief valve setting in combination with landing loads.

[Revision note: Combines §§ 4b.375 and 4b.375-1]

§ 25.571 Tests for pressurized cabins.

(a) *Strength test.* The complete pressurized cabin, including doors, windows, and all valves, must be tested as a pressure vessel for the pressure differential specified in § 25.225(c).

(b) *Functional tests.* The following functional tests must be performed:

(1) Tests of the functioning and capacity of the positive and negative pressure differential valves, and of the emergency release valve, to simulate the effects of closed regulator valves.

(2) Tests of all parts of the pressurization system to show proper functioning under all possible conditions of pressure, temperature, and moisture, up to the maximum altitude selected for certification.

(3) Flight tests, to demonstrate the performance of the pressure supply, pressure and flow regulators, indicators, and warning signals, in steady and stepped climbs and descents at rates corresponding to the maximum attainable within the operating limitations of the airplane, up to the maximum altitude selected for certification.

(4) Tests of all doors and emergency exits, to show that they operate properly after being subjected to the flight tests prescribed in subparagraph (3) of this paragraph.

[Revision note: Based on § 4b.376]

FIRE PROTECTION

§ 25.581 Fire protection; general.

In addition to the requirements of §§ 25.583 through 25.593, the following requirements apply:

(a) *Hand fire extinguishers.* Hand fire extinguishers must be approved. The kinds and quantities of extinguishing agents must be appropriate for the kinds of fires likely to occur in the compartments where the extinguishers are intended for use. Extinguishers intended for use in personnel compartments must be designed so as to minimize the hazard of toxic gas concentrations. A readily accessible hand fire extinguisher must be availble for use in each compartment.

(b) *Built-in fire extinguishers.* If a built-in fire-extinguishing system is required, its capacity in relation to the compartment volume and ventilation rate must be sufficient to combat any fire likely to occur in the compartment. Built-in fire-extinguishing systems must be installed so that no hazardous quantity of extinguishing agent is likely to enter personnel compartments and so that discharge of the extinguisher cannot result in structural damage.

(c) *Protective breathing equipment.* If the airplane has Class A, B, or E cargo compartments, protective breathing equipment must be installed for the use of appropriate crewmembers.

[Revision note: Combines §§ 4b.380, second sentence of 4b.383(a), and 4b.383(b)(3)]

§ 25.583 Compartment interiors.

(a) In all compartments to be occupied by passengers or crewmembers—

(1) The material used in the compartment must be at least flash-resistant;

(2) The wall and ceiling linings, and the covering of all upholstering, floors, and furnishings, must be flame-resistant;

(3) Where smoking is allowed, self-contained completely removable ash trays must be installed;

(4) Where smoking is not allowed, placards to this effect must be installed;

(5) All receptacles for used towels, papers, and waste, must be fire-resistant and must have covers or other provisions for containing possible fires; and

(6) There must be at least one hand fire extinguisher for use by the flight crew.

(b) In addition to the requirements of paragraph (a) of this section, each passenger compartment with a passenger capacity of seven or more must have at least the following number of conveniently located hand fire extinguishers:

Passenger capacity	*Fire extinguishers*
7 through 30	1
31 through 60	2
61 or more	3

[Revision note: Based on § 4b.381]

§ 25.585 Cargo and baggage compartments.

(a) Controls, wiring, lines, equipment, or accessories, whose failure or damage would affect the safe operation of the airplane, may not be located in cargo or baggage compartments unless—

(1) They are shielded, isolated, or otherwise protected, so that they cannot be damaged by movement of cargo in the compartment; and

(2) Damage or failure of these items would not create a fire hazard.

(b) There must be provisions to prevent cargo or baggage from interfering with the functioning of the fire-protective features of the compartment.

(c) Materials used in the construction of cargo or baggage compartments (including tie-down equipment) must be flame-resistant.

(d) Sources of heat within the compartment must be shielded and insulated to prevent igniting the cargo.

[Revision note: Based on § 4b.382]

§ 25.587 Cargo compartment classification.

(a) *Class A.* A Class A cargo or baggage compartment is one in which—

(1) The presence of a fire would be easily discernible to a crewmember while at his station; and

(2) All parts of the compartment are easily accessible in flight.

(b) *Class B.* A Class B cargo or baggage compartment is one in which—

(1) There is sufficient access in flight to enable a crew member to effectively reach all parts of the compartment and its contents with a hand fire extinguisher;

(2) The compartment is designed so that when the access provisions are being used, no hazardous quantity of smoke, flames, or extinguishing agent, will enter any compartment occupied by the crew or passengers;

(3) The compartment has a separate approved smoke detector or fire detector system to give warning at the pilot or flight engineer station; and

(4) The compartment is lined with fire-resistant material.

(c) *Class C.* A Class C cargo or baggage compartment is one not meeting the requirements for either a Class A or B compartment but in which—

(1) There is a separate approved smoke detector or fire detector system to give warning at the pilot or flight engineer station;

(2) There is an approved built-in fire-extinguishing system controllable from the pilot or flight engineer stations;

(3) There are means to exclude hazardous quantities of smoke, flames, or extinguishing agent, from any compartment occupied by the crew or passengers;

(4) There are means to control ventilation and drafts within the compartment so that the extinguishing agent used can control any fire that may start within the compartment; and

(5) The compartment is lined with fire-resistant material.

(d) *Class D.* A Class D cargo or baggage compartment is one that is designed and constructed so that—

(1) A fire occurring in it will be completely confined without endangering the safety of the airplane or the occupants;

(2) There are means to exclude hazardous quantities of smoke, flames, or other noxious gases, from any compartment occupied by the crew or passengers;

(3) Ventilation and drafts are controlled within each compartment so that any fire likely to occur in the compartment will not progress beyond safe limits;

(4) The compartment is lined with fire-resistant material; and

(5) Consideration is given to the effect of heat within the compartment on adjacent critical parts of the airplane.

(e) *Class E.* A Class E cargo compartment is one on airplanes used only for the carriage of cargo and in which—

(1) The compartment is lined with fire-resistant material;

(2) The compartment has a separate approved smoke or fire detector system to give warning at the pilot or flight engineer station;

(3) There are means to shut off the ventilating airflow to, or within, the compartment, and the controls for these means are accessible to the flight crew in the crew compartment;

(4) There are means to exclude hazardous quantities of smoke, flames, or noxious gases, from the flight crew compartment; and

(5) The required crew emergency exits are accessible under all cargo loading conditions.

[Revision note: Based on § 4b.383 (less second sentence of (a) and (b)(3))]

§ 25.589 Proof of compliance.

(a) Compliance with those provisions of § 25.587 that refer to compartment accessibility, to the entry of hazardous quantities of smoke or extinguishing agent into compartments occupied by the crew or passengers, and to the dissipation of the extinguishing agent in Class C compartments, must be shown by flight tests.

(b) During the tests required by this section, it must be shown that no inadvertent operation of smoke or fire detectors in adjacent or other compartments within the airplane would occur as a result of fire contained in any one compartment, either during or after extinguishment, unless the extinguishing system floods these compartments simultaneously.

[Revision note: Based on § 4b.384]

§ 25.591 Flammable fluid fire protection.

In areas of the airplane where flammable fluids or vapors might be released by leakage or failure in fluid systems, design precautions must be made to safeguard against the ignition of these fluids or vapors because of the operation of other equipment, or to control any fire resulting from the ignition of these fluids or vapors.

[Revision note: Based on § 4b.385]

§ 25.593 Combustion heater fire protection.

(a) *Combustion heater fire zones.* The following regions are designated as combustion heater fire zones and must be protected from fire in accordance with the applicable provisions of §§ 25.871 through 25.889 and 25.893:

(1) The region surrounding the heater, if this region contains any flammable fluid system components (other than the heater fuel system) that might be damaged by heater malfunctioning or that, in case of leakage or failure, might allow flammable fluids or vapors to reach the heaters.

(2) The region surrounding the heater, if the heater fuel system has fittings that, if they leaked, would allow fuel or vapors to enter this region.

(3) The part of the ventilating air passage that surrounds the combustion chamber. However, no fire extinguishment is required in cabin ventilating air passages.

(b) *Ventilating air ducts.* (1) Ventilating air ducts that pass through fire zones must be fireproof.

(2) Unless isolation is provided by the use of fireproof valves, or by equivalent effective means, the ventilating air duct downstream of the heater must be fireproof for a distance great enough to ensure that any fire originating from within the heater can be contained within the duct.

(3) Parts of ventilating ducts passing through regions in the airplane where there are flammable fluid systems must be constructed, or isolated from these systems, so that failure or malfunctioning of the flammable fluid system components cannot introduce flammable fluids or vapors into the ventilating airstream.

(c) *Combustion air ducts.* (1) Combustion air ducts must be fireproof for a distance great enough to prevent damage from backfiring or reverse flame propagation.

(2) Combustion air ducts may not have a common opening with the ventilating airstream unless it is shown that flames from backfires or reverse burning cannot enter the ventilating airstream under any conditions of ground or flight operation (including conditions of reverse flow or malfunctioning of the heater or its associated components).

(3) Combustion air ducts may not restrict prompt relief of backfires that can cause heater failure due to pressures generated in the heater.

(d) *Heater controls; general.* There must be provisions to prevent hazardous accumulations of water or ice on or within heater control components, control system tubing, or safety controls.

(e) *Heater safety controls.* (1) In addition to the components provided for normal continuous control of air temperature, airflow, and fuel flow, there must be means, independent of these components, for each heater to automatically shut off that heater's ignition and fuel supply at a point remote from the heater when the heat exchanger temperature or ventilating air temperature exceeds safe limits or when either the combustion airflow or the ventilating airflow becomes inadequate for safe operation. The means for each heater must be independent of any component serving other heaters with a heat output that is essential to the safe operation of the airplane.

(2) There must be a warning means to indicate to the crew when a heater with a heat output that is essential to the safe operation of the airplane has been shut off by the operation of the automatic means prescribed in subparagraph (1) of this paragraph.

(f) *Air intakes.* Combustion and ventilating air intakes must be located where no flammable fluids or vapors can enter the heater system under any condition of ground or flight operation, either during normal operation or as a result of malfunctioning, failure, or improper operation of other airplane components.

(g) *Heater exhaust.* Heater exhaust systems must conform to the provisions of §§ 25.821 and 25.823. In addition, there must be provisions in the design of the heater exhaust system so that the products of combustion will be safely conveyed overboard to prevent the occurence of—

(1) Fuel leakage from the exhaust to surrounding compartments;

(2) Exhaust gas impingement on surrounding equipment or structure;

(3) Ignition of flammable fluids by the exhaust, if the exhaust is in a compartment containing flammable fluid lines; and

(4) Restriction by the exhaust of the prompt relief of backfires that can cause heater failure due to pressure generated within the heater.

(h) *Heater fuel systems.* Heater fuel systems must conform to all parts of the powerplant fuel system requirements that affect safe heater operation. In addition, heater fuel system components within the ventilating airstream must be protected by shrouds so that leakage from these components cannot enter the ventilating airstream.

(i) *Drains.* There must be means to safely drain fuel accumulations that might occur within the combustion chamber or the heat exchanger. The parts of these drains that operate at high temperatures must be protected in the same manner as heater exhausts. Drains must be protected from hazardous ice accumulations in flight and during ground operation.

[Revision note: Based on § 4b.386]

MISCELLANEOUS

§ 25.601 Reinforcement near propellers.

The parts of the airplane near propeller tips must have sufficient strength and stiffness to withstand both the effects of the induced vibration and of ice thrown from the propeller. Windows may not be located in these regions unless it is shown that they are able to withstand the most severe ice impact likely to occur.

[Revision note: Based on § 4b.390]

§ 25.603 Leveling marks.

The airplane must have reference marks for leveling the airplane on the ground to facilitate weight and balance determinations.

[Revision note: Based on § 4b.391]

Subpart E—Powerplant

INSTALLATION

§ 25.641 Powerplant installation; general.

(a) The powerplant installation of an aircraft includes all components that are necessary for propulsion and all components that affect the control of the major propulsive units or that affect their safety of operation between normal inspections or overhauls. "All components" of a powerplant means all elements of that installation that are furnished by the airplane, engine, or propeller manufacturer.

(b) All engine installations must conform to the applicable provisions of this subpart.

(c) Components of the powerplant installation must be designed and built to ensure their safe operation between normal inspections or overhauls.

(d) The powerplant installation must be accessible for all necessary inspections and maintenance.

(e) The major components of the powerplant installation must be electrically bonded to the other parts of the airplane.

[Revision note: Combines §§ 4b.400 and 4b.400-2]

§ 25.643 Engines.

(a) Engines installed in airplanes to be type certificated under this Part must be type certificated in accordance with the provisions of Part 33 [New] (present Part 13) of this subchapter.

(b) Powerplants must be arranged and isolated from each other to allow operation in at least one configuration in which the failure or malfunction of any engine, or of any system that can affect the engine, will not—

(1) Prevent the continued safe operation of the remaining engine(s); or

(2) Require immediate action by a crewmember for continued safe operation.

(c) There must be a means to individually stop and restart the rotation of any engine in flight. However, for turbine engine installations, a means to stop rotation is required only if continued rotation could jeopardize the safety of the airplane. All components of the stopping and restarting system that are on the engine side of the firewall, and that might be exposed to fire, must be fire-resistant. If hydraulic propeller feathering systems are used for this purpose, the feathering lines must be fire-resistant under the operating conditions that may be expected to exist when feathering is being accomplished.

(d) Unless the engine type certificate specifies that the engine rotor cases have been substantiated as being able to contain the damage resulting from rotor blade failure, turbine engine power plant installations must have a protection means so that rotor blade failure in any engine will not affect the operation of remaining engines nor jeopardize the continued safe operation of the airplane.

(e) Design precautions to minimize the probability of jeopardizing the safety of the airplane in the event of engine turbine rotor failure, must be taken unless—

(1) The engine type certificate specifies that the turbine rotors have been shown to have sufficient strength to withstand damage-inducing factors (such as those that might result from abnormal rotor speed, temperature, or vibration); and

(2) The powerplant systems associated with engine control devices, systems, and instrumentation, give reasonable assurance that those engine operating limitations that adversely affect turbine rotor structural integrity will not be exceeded in service.

[Revision note: Based on § 4b.401]

§ 25.645 Propellers.

(a) Propellers installed in airplanes certificated under this part must be type certificated in accordance with the provisions of Part 35 [New] (present Part 14) of this subchapter.

(b) Engine power and propeller shaft rotational speed may not exceed the limits for which the propeller is certificated.

[Revision note: Based on § 4b.402]

§ 25.647 Propeller vibration.

The magnitude of the propeller blade vibration stresses under all normal conditions of operation must be determined by actual measurement or by comparison with similar installations for which these measurements have been made. The determined vibration stresses may not exceed values that have been shown to be safe for continuous operation.

[Revision note: Based on § 4b.403]

§ 25.649 Propeller pitch and speed limitations.

(a) The propeller pitch and speed must be limited to values that will ensure—

(1) Safe operation under all normal conditions; and

(2) Compliance with the performance requirements specified in §§ 25.31 through 25.55 for reciprocating engine-powered airplanes, and §§ 25.61 through 25.91 for turbo-propeller powered airplanes.

(b) There must be a propeller speed limiting means at the governor. It must be set to limit the maximum possible governed engine speed to a value not exceeding the maximum allowable r.p.m.

(c) The low pitch blade stop, or other means used to limit the low pitch position of the propeller blades, must be set so that the engine speed does not exceed 103 percent of the maximum allowable engine r.p.m. with—

(1) The propeller blades at the low pitch limit and governor inoperative; and

(2) The engine operating at takeoff manifold pressure with the airplane stationary under standard atmospheric conditions.

[Revision note: Based on § 4b.404]

§ 25.651 Propeller clearance.

Unless smaller clearances are properly substantiated, propeller clearances with the airplane at maximum certificated weight, with the most adverse center of gravity, and with the propeller in the most adverse pitch position, may not be less than the following:

(a) *Ground clearance.* There must be a clearance of at least seven inches (for airplanes with nose wheel landing gear) or nine inches (for airplanes with tail wheel landing gear) with the landing gear statically deflected and the airplane in the level takeoff, or taxiing altitude, whichever is most critical. In addition, there must be positive clearance between the propeller and the ground when the airplane is in the level takeoff attitude with the critical tire completely deflated and the corresponding landing gear strut bottomed.

(b) *Water clearance.* There must be a clearance of at least 18 inches between each propeller and the water, unless compliance with § 25.165(a) can be shown with a lesser clearance.

(c) *Structural clearance.* (1) There must be at least one inch radial clearance between the blade tips and the airplane structure, and whatever additional radial clearance is necessary to prevent harmful vibration.

(2) There must be a minimum longitudinal clearance of one-half inch between the propeller blades or cuffs and stationary parts of the airplane. There must be adequate clearance between other rotating parts of the propeller or spinner and stationary parts of the airplane.

[Revision note: Based on § 4b.405]

§ 25.653 Propeller deicing provisions.

(a) For airplanes intended for use where icing may be expected, there must be a means to prevent or remove hazardous ice accumulation on propellers or on accessories where ice accumulation would jeopardize engine performance.

(b) If combustible fluid is used for propeller deicing, the provisions of §§ 25.871 through 25.877 apply.

[Revision note: Based on § 4b.406]

§ 25.655 Reversing systems.

(a) Reversing systems intended for ground operation only must be designed so that no single failure nor malfunction of the system, under all anticipated conditions of airplane operation, will result in unwanted reverse thrust. Failure of structural elements need not be considered if occurrence of this kind of failure is extremely remote.

(b) Turbojet reversing systems intended for inflight use must be designed so that no unsafe condition will result during normal operations of the system, or from any failure (or reasonably likely combination of failures) of the reversing system, under all anticipated conditions of operation of the airplane. Failure of structural elements need not be considered if occurrence of this kind of failure is extremely remote.

(c) Compliance with this section may be shown by failure analysis, testing, or both, for propeller systems that allow propeller blades to move from the flight low-pitch position to a position that is substantially less than that at the normal flight low-pitch stop position. The analysis may include or be supported by the analysis made to show compliance with the requirements of § 35.____ (present § 14.103) of this subchapter for the propeller and associated installation components.

[Revision note: Combines §§ 4b.407 and 4b.407-1 (less first sentence of (b) and (c))]

§ 25.657 Turbopropeller-drag limiting systems.

Turbopropeller-powered airplane propeller-drag limiting systems must be designed so that no single failure or malfunction of any of the systems during normal or emergency operation results in propeller drag in excess of that for which the airplane was designed in compliance with § 25.227. Failure of structural elements of the drag limiting systems need not be considered if occurrence of this kind of failure is extremely remote.

[Revision note: Based on § 4b.408]

§ 25.659 Turbine engine powerplant operating characteristics.

Turbine engine powerplant operating characteristics must be investigated in flight to determine that no adverse characteristics (such as stall, surge, or flameout) are present to a hazardous degree, during normal and emergency operation of the airplane within the range of operating limitations of the airplane and of the engine.

[Revision note: Based on § 4b.409]

FUEL SYSTEM OPERATION AND ARRANGEMENT

§ 25.671 General.

(a) The fuel system must be constructed and arranged so that a flow of fuel, at a rate and pressure that have been established for proper engine functioning under all likely operating conditions (including all maneuvers for which the airplane is intended), is ensured.

(b) The fuel system must be arranged so that no fuel pump can draw fuel from more than one tank at a time, unless there are means to prevent the introduction of air into the system.

[Revision note: Based on § 4b.410]

§ 25.673 Fuel system independence.

The design of the fuel system must conform to the requirements of § 25.643 (b). An acceptable means of compliance with the requirements of § 25.643(b) is a fuel system arranged to allow the supply of fuel to each engine through a system independent of any part of a system supplying fuel to any other engine.

[Revision note: Based on § 4b.411]

§ 25.675 Fuel flow.

(a) The fuel system must provide at least 100 percent of the fuel flow required by the engines when the airplane is operated under all intended operating conditions and maneuvers. In showing compliance with this requirement—

(1) The fuel must be delivered to the engine at a pressure within the limits specified in the engine type certificate;

(2) The quantity of fuel in the tank may not exceed the sum of the unusable fuel supply for that tank (determined in accordance with § 25.677) and whatever minimum quantity of fuel it may be necessary to add for the purpose of showing compliance;

(3) The main pumps necessary for each operating condition and airplane attitude for which compliance is determined must be used;

(4) The appropriate emergency pumps must be substituted for each main pump used in subparagraph (3) of this paragraph; and

(5) The fuel flowmeter (if there is one) must be blocked during the flow determination and the fuel must flow through the meter or its bypass.

(b) If an engine can be supplied with fuel from more than one tank, it must be possible to regain the full fuel pressure of that engine in not more than 20 seconds after switching to any other fuel tank when engine malfunctioning becomes apparent due to the depletion of the fuel supply in any tank from which the engine can be fed.

[Revision note: Based on § 4b.413]

§ 25.677 Unusable fuel supply.

The selected unusable fuel supply may not be less than that quantity, established for each tank, at which the first evidence of malfunctioning occurs under the most adverse condition, from the standpoint of fuel feed, during all intended operations and flight maneuvers involving use of that tank.

[Revision note: Based on § 4b.416]

§ 25.679 Fuel system hot weather operation.

(a) The fuel system must be shown to perform satisfactorily in hot weather operation. This must be shown by climbing from the altitude at any airport chosen by the applicant to the altitude corresponding to that at which the one-engine-inoperative best rate of climb is not more than the en route climb with the configuration and at the weight specified in § 25.51(d). There may be no evidence of vapor lock or other malfunctioning. The climb test must be conducted under the following conditions:

(1) For reciprocating-engine-powered airplanes, all engines must operate at maximum continuous power, except that takeoff power must be used for the altitude range extending from 1,000 feet below the critical altitude through the critical altitude. The time interval during which takeoff power is used may not be less than the takeoff time limitation.

(2) For turbine-engine-powered airplanes, all engines must operate at takeoff power for the time interval selected for showing the takeoff flight path and, thereafter, must operate at maximum continuous power for the duration of the climb.

(3) The weight of the airplane must be the weight with full fuel tanks, minimum crew, and as much ballast as is required to maintain the center of gravity within allowable limits.

(4) The speed of climb may not exceed the speed that will allow compliance with the minimum climb requirement specified in § 25.49(a).

(5) The fuel temperature must be at least 110° F.

(b) The test prescribed in paragraph (a) of this section may be performed either in flight or on the ground closely simulating flight conditions. If a flight test is performed in weather cold enough to interfere with the proper conduct of the test, the fuel tank surfaces, fuel lines, and other fuel system parts, subjected to cooling action from cold air must be insulated to simulate, in so far as practicable, flight in hot weather.

[Revision note: Based on § 4b.417]

§ 25.681 Fuel flow between interconnected tanks.

If it is possible to pump fuel from one tank to another in flight, the fuel tank vents and the fuel transfer system must be designed so that no structural damage to the tanks can occur because of overfilling.

[Revision note: Based on § 4b.418]

FUEL SYSTEM CONSTRUCTION AND INSTALLATION

§ 25.691 General.

(a) Fuel tanks must be able to withstand, without failure, all vibration, inertia, fluid, and structural loads that they may be subjected to in operation.

(b) Flexible fuel tank liners must be approved or must be shown to be suitable for the particular application.

(c) Integral type fuel tanks must have facilities for interior inspection and repair.

(d) Fuel tanks within the fuselage contour must be able to resist rupture, and to retain the fuel, under the inertia forces prescribed for the emergency landing conditions in § 25.331. In addition, these tanks must be in a protected position so that exposure of the tanks to scraping action with the ground is unlikely.

(e) The augmentation liquid tank capacity available for the use of each engine must be large enough to allow operation of the airplane in accordance with the approved procedures for the use of liquid-agumented power. The computation of liquid consumption must be based on the maximum approved rate appropriate for the desired engine output, and must include the effect of temperature on engine performance as well as any other factors that might cause a variation in the amount of liquid required.

[Revision note: Based on § 4b.420]

§ 25.693 Fuel tank tests.

(a) It must be shown by tests that the fuel tanks, as mounted in the airplane, are able to withstand, without failure or leakage, the more critical of the pressures resulting from the conditions specified in subparagraphs (1) and (2) of this paragraph. In addition, it must be shown by either analysis or tests, that tank surfaces subjected to more critical pressures resulting from the condition of subparagraphs (3) and (4) of this paragraph, are capable of withstanding these pressures:

(1) Internal pressure of 3.5 psi.

(2) 125 percent of the maximum air pressure developed in the tank from ram effect.

(3) Fluid pressures developed during maximum limit accelerations, and deflections, of the airplane with a full tank.

(4) Fluid pressures developed during the most adverse combination of airplane roll and fuel load.

(b) Metallic tanks with large unsupported or unstiffened flat surfaces, the failure or deformation of which could cause fuel leakage, must be able to withstand a vibration test in accordance with the requirements of subparagraphs (1) and (2) of this paragraph, or an equivalent test, without leakage or excessive deformation of the tank walls:

(1) The complete tank assembly and its supports must be vibration tested while mounted to simulate the actual installation. The tank assembly must be vibrated for 25 hours at an amplitude of not less than 1/32 of an inch (unless another amplitude is substantiated) while 2/3 filled with water or other suitable test fluid. The frequency of vibration must be 90 percent of the maximum continuous rated engine speed unless another frequency within the normal operating range of engine speeds is more critical. If another frequency within the normal operating range of engine speeds is more critical, it must be used, and the time of the test must be adjusted to accomplish the same number of vibration cycles as would be accomplished during 25 hours at a frequency of 90 percent of the maximum continuous rated engine speed.

(2) During the vibration test, the tank assembly must be rocked for 25 hours at the rate of 16 to 20 complete cycles per minute, through an angle of 15° on either side of the horizontal (30° total), about the most critical axis. If motion about more than one axis is likely to be critical, the tank must be rocked about each axis for 12½ hours.

(c) Except where satisfactory operating experience with a similar tank in a similar installation is shown, nonmetallic tanks must withstand the test specified in paragraph (b)(2) of this section, with fuel at a temperature of 110° F. During this test, a representative specimen of the tank must be installed in a supporting structure simulating the installation in the airplane.

[Revision note: Based on § 4b.421]

§ 25.695 Fuel tank installations.

(a) Fuel tanks must be supported so that tank loads (resulting from the weight of the fuel in the tanks) are not concentrated on unsupported tank surfaces. Pads must be used to prevent chafing between the tank and its supports. Materials used for padding must be nonabsorbent or must be treated to prevent the absorption of fluids.

(b) If flexible tank liners are used, they must be supported so that they are not required to withstand fluid loads. Interior surfaces of the tank compartment must be smooth and free of projections that could cause wear of the liner unless provisions are made for protection of the liner at these points or the construction of the liner itself provides this protection.

(c) Spaces adjacent to the surfaces of fuel tanks must be ventilated to avoid fume accumulation in the event of minor leakage. If the tank is in a sealed compartment, the ventilating means may be drain holes large enough to prevent excessive pressure resulting from altitude changes.

(d) The location of fuel tanks must conform to the requirements of § 25.873 (a). In addition, no part of engine nacelle skin that lies immediately behind a major air outlet from the engine compartment may act as the wall of an integral tank.

(e) Fuel tanks must be isolated from personnel compartments by means of fumeproof and fuelproof enclosures.

[Revision note: Based on § 4b.422]

§ 25.697 Fuel tank expansion space.

Fuel tanks must have an expansion space of at least two percent of the tank capacity. It may not be possible to inadvertently fill the fuel tank expansion space when the airplane is in the normal ground attitude.

[Revision note: Based on § 4b.423]

§ 25.699 Fuel tank sump.

(a) Each fuel tank must have a sump with an effective capacity, in the normal ground attitude, of not less than 0.10 percent of the tank capacity or one-sixteenth of a gallon, whichever is greater. However, a smaller capacity may be used if operating limitations are established to ensure that the accumulation of water in service will not exceed the sump capacity.

(b) The fuel tank must be constructed to allow drainage of any hazardous quantity of water from all parts of the tank to the sump when the airplane is in the ground attitude.

(c) Fuel tank sumps must have an accessible drain to allow complete drainage of the sump on the ground. The drain must discharge clear of all part of the airplane and must have either manual or automatic means to positively lock it in the closed position.

[Revision note: Based on § 4b.424]

§ 25.701 Fuel tank filler connection.

(a) Fuel tank filler connections must be designed so that fuel cannot enter the fuel tank compartment or any part of the airplane other than the tank itself. Recessed fuel tank filler connections that retain any appreciable quantity of fuel must have a drain that discharges clear of all parts of the airplane. All fuel tank filler connections must be marked as prescribed in § 25.1209.

(b) The fuel tank filler cap must provide a fuel-tight seal for the fuel tank opening.

[Revision note: Based on § 4b.425]

§ 25.703 Fuel tank vents.

(a) Fuel tanks must be vented from the top part of the expansion space so that venting of the tank is effective under all normal flight conditions. The vent outlet must be constructed and located so that it cannot be obstructed by ice or by other foreign matter. The vent construction must also prevent siphoning fuel during normal operation. In addition, the vent must be large enough to prevent the existence of excessive differences of pressure between the interior and exterior of the tank during normal flight operation, during maximum rate of descent, and, if applicable, during refueling and defueling.

(b) Unless there are drainage provisions at these places, there may be no places in the vent line where moisture can accumulate while the airplane is in either the ground or the level flight attitude.

(c) Vents and drainage may not terminate at points where the discharge of fuel from the vent or drainage outlet will constitute a fire hazard or from which fumes could enter personnel compartments.

(d) Airspaces of tanks with interconnected outlets must also be interconnected.

[Revision note: Based on § 4b.426(a)]

§ 25.705 Carburetor vapor vents.

Carburetors that have vapor elimination connections must also have a vent line that will lead the vapor back to one of the fuel tanks. In addition—

(a) There must be provisions in the vent system to avoid stoppage by ice; and

(b) The vapor vent return line must lead back to the fuel tank used for takeoff and landing if there is more than one fuel tank and it is necessary to use the tanks in a definite sequence.

[Revision note: Based on § 4b.426 (less (a))]

§ 25.707 Fuel tank outlet.

There must be a fuel strainer with 8 to 16 meshes per inch for the fuel tank outlet or for the booster pump. In addition—

(a) The clear area of the fuel tank outlet strainer may not be less than five times the area of the fuel tank outlet line;

(b) The diameter of the strainer may not be less than the diameter of the fuel tank outlet; and

(c) Finger strainers, if used, must be accessible for inspection and cleaning.

[Revision note: Based on § 4b.427]

§ 25.709 Under-wing fueling provisions.

(a) Under-wing fuel tank connections must have a means to prevent the escape of hazardous quantities of fuel from the tank while the cover plate is removed, if there is a malfunction of the fuel entry valve.

(b) The airplane must have a primary means to limit the fuel tank content and a secondary means that will prevent damage to the tank if the primary means fails.

[Revision note: Based on § 4b.428]

FUEL SYSTEM COMPONENTS

§ 25.721 Fuel pumps.

(a) Except as provided in paragraph (b) of this section, a main pump is a pump that is required for proper engine operation or to meet the fuel system requirements of this subpart. There must be provisions to allow the bypass of all positive displacement main fuel pumps, except fuel injection pumps (that is, a pump that supplies proper flow and pressure for fuel injection when the injection is not accomplished in a carburetor) approved as part of the engine.

(b) Except when fuel injection pumps approved as part of the engine are used, there must be emergency pumps that are immediately available to supply all engines with fuel if any one main fuel pump fails. Another main pump may be used as an emergency pump after failure of one main pump.

[Revision note: Combines §§ 4b.430 and 4b.430-1]

§ 25.723 Fuel system lines and fittings.

(a) Fuel lines must be installed and supported to prevent excessive vibration and to withstand loads due to fuel pressure and to accelerated flight conditions.

(b) Fuel lines that are connected to components of the airplane between which relative motion could exist must have provisions for flexibility.

(c) The provisions for flexibility in fuel lines that may be under pressure and subjected to axial loading must incorporate flexible hose assemblies, not hose-clamp connections.

(d) Flexible hose must be approved or must be shown to be suitable for the particular application.

(e) Flexible hoses that might be adversely affected by exposure to high temperatures may not be used where excessive temperatures exist during operation or after engine shut-down.

[Revision note: Based on § 4b.432]

§ 25.725 Fuel lines and fittings in designated fire zones.

Fuel lines and fittings in all designated fire zones must conform to the provisions of § 25.877.

[Revision note: Based on § 4b.433]

§ 25.727 Fuel valves.

In addition to the requirements of § 25.875 for shutoff means, all fuel valves must—

(a) Have positive stops or suitable index provisions in the "on" and "off" positions; and

(b) Be supported so that loads resulting from their operation or from accelerated flight conditions are not transmitted to the lines attached to the valve.

[Revision note: Based on § 4b.434]

§ 25.729 Fuel strainer or filter.

(a) There must be a fuel strainer or filter between the tank outlet and the fuel metering device of the engine. In addition, the fuel strainer or filter must be—

(1) Located between the tank outlet and the engine-driven pump inlet, if there is an engine-driven fuel pump;

(2) Accessible for drainage and cleaning and, for the strainer screen, easily removable; and

(3) Mounted so that its weight is not supported by the connecting lines or by the inlet or outlet connections of the strainer or filter itself.

(b) Unless there are means in the fuel system to prevent the accumulation of ice on the filter, there must be provisions to automatically maintain the fuel flow if ice-clogging of the filter occurs.

(c) The fuel strainer or filter must be of adequate capacity (commensurate with operating limitations established to ensure proper service) and of appropriate mesh to ensure proper engine operation, with the fuel contaminated to a degree (with respect to particle size and density) that can be reasonably expected to occur in service. The degree of fuel filtering may not be less than that established for the engine in accordance with Part 33 [New] (present Part 13) of this subchapter.

[Revision note: Based on § 4b.435]

§ 25.731 Fuel system drains.

Drainage of the fuel system must be accomplished by the use of fuel strainer and fuel tank sump drains. The drains must discharge clear of all parts of the airplane and must have manual or automatic means for positive locking of the drain in the closed position.

[Revision note: Based on § 4b.436]

§ 25.733 Fuel jettisoning system.

(a) If the maximum certificated takeoff weight is more than 105 percent of the maximum certificated landing weight, there must be a fuel jettisoning system able to jettison enough fuel to bring the actual takeoff weight down to the maximum certificated landing weight. The average rate of fuel jettisoning must be at least 1 percent of the maximum takeoff weight per minute, except that the time required to jettison the fuel need not be less than 10 minutes. Compliance with these provisions must be shown at maximum takeoff weight, with flaps and landing gear up, and in—

(1) A power-off glide at a speed of $1.4 V_{S_1}$;

(2) A climb at the one-engine-inoperative best rate-of-climb speed, with the critical engine inoperative and the remaining engine(s) at maximum continuous power; and

(3) Level flight at a speed of $1.4 V_{S_1}$, if the results of the tests in the conditions specified in subparagraphs (1) and (2) of this paragraph indicate that this condition could be critical.

(b) During the flight tests prescribed in paragraph (a) of this section, it must be shown that—

(1) The fuel jettisoning system and its operation are free from fire hazard;

(2) The fuel discharges clear of all parts of the airplane;

(3) Fuel or fumes do not enter any parts of the airplane; and

(4) The jettisoning operation does not adversely affect the controllability of the airplane.

(c) For reciprocating engine powered airplanes, the jettisoning system must be designed so that it is not possible to jettison the fuel in the tanks used for takeoff and landing below the level allowing 45 minutes flight at 75 percent maximum continuous power. However, if there is an auxiliary control independent of the main jettisoning control, the system may be designed to jettison all the fuel.

(d) For turbine engine powered airplanes the jettisoning system must be designed so that it is not possible to jettison fuel in the tanks used for takeoff and landing below the level allowing climb from sea level to 10,000 feet and thereafter allowing 45 minutes cruise at a speed for maximum range.

(e) The fuel jettisoning valve must be designed to allow flight personnel to close the valve during any part of the jettisoning operation.

(f) Unless it is shown that lowering of the flaps does not adversely affect fuel jettisoning, there must be a placard, adjacent to the jettisoning control, to warn flight personnel against jettisoning fuel while the flaps are lowered. This warning must also be recorded in the Airplane Flight Manual.

(g) The fuel jettisoning system must be designed so that any reasonably probable single malfunction in the system will not result in a hazardous condition due to unsymmetrical jettisoning of, or inability to jettison, fuel.

[Revision note: Based on § 4b.437]

Oil System

§ 25.741 General.

(a) Each engine must have an independent oil system able to supply that engine with an appropriate quantity of oil at a temperature not exceeding the maximum that has been established as safe for continuous operation.

(b) The usable oil tank capacity may not be less than the product of the endurance of the airplane under critical operating conditions and the approved maximum allowable oil consumption rate of the engine under the same conditions, plus a suitable margin to ensure systems circulation. Instead of a rational analysis of airplane range for the purpose of computing oil requirements for reciprocating engine powered airplanes, the following fuel/oil ratios may be used:

(1) For airplanes without a reserve oil or oil transfer system, a fuel/oil ratio of 30:1 by volume.

(2) For airplanes with either a reserve oil or oil transfer system, a fuel/oil ratio of 40:1 by volume.

(c) Fuel/oil ratios higher than those prescribed in paragraphs (b) (1) and (2) of this section may be used if substantiated by data on actual engine oil consumption.

[Revision note: Based on § 4b.440]

§ 25.743 Oil tank expansion space.

Each oil tank must have an expansion space of not less than 10 percent of the tank capacity, or 0.5 gallon, whichever is greater. However, reserve oil tanks with no direct connection to any engine may have an expansion space as low as 2 percent of the tank capacity. It may not be possible to inadvertently fill the expansion space when the airplane is in the normal ground attitude.

[Revision note: Based on § 4b.441(a)]

§ 25.745 Oil tank filler connection.

(a) Recessed oil tank filler connections that retain any appreciable quantity of oil must have a drain that discharges clear of all parts of the airplane. Oil tank filler connections must be marked as prescribed in § 25.1209.

(b) The oil tank filler cap must provide an oil tight seal for the oil tank opening.

[Revision note: Based on §4b.441(b)]

§ 25.747 Oil tank vent.

Oil tanks must be vented from the top part of the expansion space so that venting of the tank is effective under all normal flight conditions. The oil tank vents must be arranged so that condensation of water vapor that might freeze and obstruct the line cannot accumulate at any point.

[Revision note: Based on § 4b.441(c)]

§ 25.749 Oil tank outlet.

There must be provisions to prevent foreign objects that might obstruct the flow of oil through the system from entering the tank or the tank outlet. The tank outlet may not be enclosed by a screen or guard that would reduce the flow of oil below a safe value at any operating temperature condition.

[Revision note: Based on § 4b.441(d)]

§ 25.751 Flexible oil tank liners.

Flexible oil tank liners must be approved or must be shown to be suitable for the particular application.

[Revision note: Based on § 4b.441 (less (a) through (d))]

§ 25.753 Oil tank tests.

Oil tanks must be able to withstand, without failure, all vibration, inertia, and fluid loads that they are subjected to in operation. In addition, they must meet all of the requirements of § 25.693 for fuel tank tests except that—

(a) The test pressure used to comply with § 25.693(a) must be 5 psi; and

(b) The test fluid used to comply with § 25.693(c) must be oil at 250° F.

[Revision note: Based on § 4b.442]

§ 25.755 Oil tank installation.

The oil tank installation must meet the requirements of § 25.695 for fuel tank installation except that an engine oil tank may be in a designated fire zone if the tank and its supports are fireproof to the extent that damage by fire to any nonfireproof parts would not result in leakage or spillage of oil.

[Revision note: Based on § 4b.443]

§ 25.757 Oil lines and fittings.

Oil lines must meet the requirements of § 25.723 and oil lines and fittings in all designated fire zones must meet the requirements of § 25.877. In addition, engine breather lines must be arranged so that—

(a) Condensation of water vapor that might freeze and obstruct the line cannot accumulate at any point;

(b) The breathers discharge in a location that does not constitute a fire hazard if foaming occurs, and in a manner so that the emitted oil does not impinge upon the pilot's windshield; and

(c) The breather does not discharge into the engine air induction system.

[Revision note: Based on § 4b.444]

§ 25.759 Oil valves.

(a) Oil valves must meet the requirements of § 25.875 for shutoff means. In addition, oil valves must—

(1) Have positive stops or suitable index provisions in the "on" and "off" positions; and

(2) Be supported so that loads resulting from their operation or from accelerated flight conditions are not transmitted to the lines attached to the valve.

(b) Closing of oil shutoff means may not prevent feathering the propeller.

[Revision note: Based on § 4b.445]

§ 25.761 Oil radiators.

(a) Oil radiators must be able to withstand, without failure, all vibration, inertia, and oil pressure loads that they are subjected to in operation.

(b) Oil radiator air ducts must be located so that, in case of fire, flames coming from normal openings of the engine nacelle cannot impinge directly upon the radiator.

[Revision note: Based on § 4b.446]

§ 25.763 Oil filters.

If the power plant installation has an oil filter (strainer), the filter must be constructed and installed so that oil will continue to flow at the normal rate through the remainder of the system when the flow of oil through the filter element is completely blocked.

[Revision note: Based on § 4b.447]

§ 25.765 Oil system drains.

The oil system must have accessible drains to allow safe drainage of the entire oil system. The drain must have either manual or automatic means to positively lock it in the closed position.

[Revision note: Based on § 4b.448]

§ 25.767 Propeller feathering system.

If the propeller feathering system is dependent upon the use of the engine oil supply, provision must be made to trap a quantity of oil in the tank if the supply becomes depleted due to failure of any part of the lubricating system other than the tank itself. The quantity of trapped oil must be enough to accomplish the feathering operation and must be available only to the feathering pump. The ability of the system to accomplish feathering with the trapped supply of oil must be shown. This may be done on the ground using an auxiliary source of oil for lubricating the engine during operation.

[Revision note: Combines § 4b.449 and § 4b.449–1]

COOLING SYSTEM

§ 25.781 General.

The powerplant cooling provisions must be able to maintain the temperatures of powerplant components and engine fluids within the temperature limits established for these components and fluids, under all ground, water, and flight operating conditions.

[Revision note: Based on § 4b.450]

§ 25.783 Cooling tests.

(a) Compliance with the provisions of § 25.781 must be shown by tests, under critical ground, water, and flight operating conditions.

(b) If the tests are conducted under conditions that deviate from the maximum ambient atmospheric temperature, the recorded powerplant temperatures must be corrected in accordance with the provisions of § 25.785 (b) and (c). The corrected temperatures determined in this manner may not exceed the established limits. For reciprocating engines, the fuel used during the cooling tests must be the minimum grade approved for the engines involved. The mixture settings must be those normally used in the flight stages for which the cooling tests are conducted. The test procedures are outlined in §§ 25.787 and 25.789.

[Revision note: Based on § 4b.451(a)]

§ 25.785 Temperature corrections and assumptions.

The following temperature corrections and assumptions must be used in complying with the cooling test requirements:

(a) A maximum ambient atmospheric temperature corresponding to sea level conditions must be established by the applicant as a limitation on the operation of the airplane. The temperature lapse rate is 3.6° F. per thousand feet of altitude above sea level until a temperature of −69.7° F. is reached. Above the altitude at which this temperature is reached, the temperature is considered constant at −69.7° F.

(b) Unless a more rational correction is shown to be applicable, temperatures of all powerplant componets and engine fluids, except cylinder barrels, for which temperature limits are established, must be corrected by adding to them the difference between the maximum ambient atmospheric temperature and the temperature of the ambient air at the time of the first occurence of the maximum component or fluid temperature recorded during the cooling test.

(c) Unless a more rational correction is shown to be applicable, cylinder barrel temperatures must be corrected by adding to them 0.7 of the difference between the maximum ambient atmospheric temperature and the temperature of the ambient air at the time of the first occurrence of the maximum cylinder barrel temperature recorded during the cooling test.

[Revision note: Based on § 4b.451 (less (a))]

§ 25.787 Cooling test procedures.

(a) Compliance with the provisions of § 25.781 must be established for the takeoff, climb, en route, and landing stages of flight that correspond to the applicable performance regulations. The cooling tests must be conducted with the airplane in the configuration, and operating under the conditions, that are critical relative to cooling during each stage of flight.

(b) Temperatures must be stabilized under the conditions from which entry is made into each stage of flight being investigated. This is not required, however, when the entry condition normally is not one during which component and engine fluid temperatures would stabilize. In such a case, operation through the full entry condition must be conducted before entry into the stage of flight being investigated in order to allow temperatures to reach their natural level at the time of entry. The takeoff cooling test must be preceded by a period during which the powerplant component and engine fluid temperatures are stabilized with the engines at ground idle. A temperature is considered stablized when its rate of change is less than 2 degrees F. per minute.

(c) Cooling tests for each stage of flight must be continued until—

(1) The component and engine fluid temperatures stabilize;

(2) The stage of flight is completed; or

(3) An operating limitation is reached.

(d) For reciprocating engine powered airplanes, it may be assumed for cooling test purposes, that the takeoff stage of flight is complete when the airplane reaches an altitude of 1,500 feet above the takeoff surface or reaches a point in the takeoff where the transition from the takeoff to the en route configuration is completed and a speed is reached at which compliance with § 25.51(d) is shown, whichever point is at a higher altitude.

[Revision note: Based on § 4b.452]

§ 25.789 Cooling test procedure for hull seaplanes.

For hull seaplanes, cooling must be shown during taxiing downwind for 10 minutes, at five mph above step speed.

[Revision note: Based on § 4b.454]

INDUCTION SYSTEM

§ 25.801 General.

(a) The engine air induction system must supply the proper quantity of air to the engine under all operating conditions. In addition, it must supply air for proper fuel metering and mixture distribution with the induction system valves in any position.

(b) Each reciprocating engine must have an alternate air source that precludes the entry of rain, ice, or any other foreign matter.

(c) Air intakes may not open within the cowling, unless—

(1) That portion of the cowling is isolated from the engine accessory section by means of a fireproof diaphragm; or

(2) Provision is made to prevent the emergence of backfire flames.

(d) For turbine-engine powered airplanes—

(1) Provisions must be made to prevent hazardous quantities of fuel leakage or overflow from drains, vents, or other components of flammable fluid systems from entering the engine intake system; and

(2) The air inlet ducts must be located or protected so as to minimize the ingestion of foreign matter during takeoff, landing, or taxiing.

[Revision note: Based on § 4b.460]

§ 25.803 Induction system deicing and anti-icing provisions.

(a) For reciprocating engine powered airplanes, the engine air induction system must have means to prevent and eliminate ice accumulations. This requirement may be met by showing, in air free of visible moisture and at a temperature of 30° F., that airplanes with altitude engines using—

(1) Conventional venturi carburetors have a preheater able to provide a heat rise to 120° F. when the engine is operating at 60 percent of its maximum continuous power; or

(2) Carburetors that have features tending to reduce the probability of ice formation have a preheater able to provide a heat rise of 100° F. when the engine is operating at 60 percent of its maximum continuous power.

(b) Turbine engine powered airplanes must be able to operate throughout the flight power range without the accumulation of enough ice in the air induction system to adversely affect engine operation or cause a serious loss of power or thrust while in continuous maximum and intermittent maximum icing conditions. Continuous maximum and intermittent maximum icing conditions are derived from the values in Appendix C.

(c) There must be a means to indicate to the appropriate flight crewmember the functioning of the powerplant ice protection system.

[Revision note: Based on § 4b.461]

§ 25.805 Carburetor air preheater design.

There must be means to ensure ventilation of the carburetor air preheater when the engine is operated in cold air. The preheater must be constructed so that the exhaust manifold parts that it surrounds, and the critical parts of the preheater itself, may be inspected.

[Revision note: Based on § 4b.462]

§ 25.807 Induction system ducts.

(a) Induction system ducts ahead of the first stage of the supercharger must have drains to prevent hazardous accumulations of fuel and moisture while the airplane is in the ground attitude. The drains may not discharge in locations that might cause a fire hazard.

(b) Induction system ducts must be—

(1) Strong enough to prevent induction system failures resulting from normal backfire conditions; and

(2) Fire-resistant if they are in any fire zone for which a fire-extinguishing system is required.

(c) Ducts that are connected to components of the airplane between which relative motion could exist must have provisions for flexibility.

[Revision note: Based on § 4b.463]

§ 25.809 Induction system screens.

(a) If induction system screens are used, they must be upstream of the carburetor. It may not be possible for fuel to strike the screen.

(b) Screens may not be in parts of the induction system that are the only passage through which air can reach the engine, unless the screen is located where it can be deiced by heated air. Deicing of induction system screens by means of alcohol alone is not acceptable.

[Revision note: Based on § 4b.464]

§ 25.811 Inter-coolers and after-coolers.

Inter-coolers and after-coolers must be able to withstand without failure, all vibration, inertia, and air pressure loads that they are subjected to in operation.

[Revision note: Based on § 4b.466]

EXHAUST SYSTEM

§ 25.821 General.

(a) The exhaust system must be constructed and arranged to ensure the safe disposal of exhaust gases without creating a fire hazard or allowing carbon monoxide contamination of air in personnel compartments. Any acceptable carbon monoxide detection method may be used to show the absence of carbon monoxide.

(b) Unless appropriate precautions are taken, exhaust system parts may not be in hazardous proximity to parts of any system carrying flammable fluids or vapors nor may they be under parts of these systems that may leak.

(c) Airplane components upon which hot exhaust gases might impinge, or that could be subjected to high temperatures due to proximity to exhaust system parts, must be fireproof. In addition, all exhaust system components must be separated, by means of fireproof shields, from adjacent parts of the airplane that are outside the engine compartment.

(d) Exhaust gases may not discharge in a manner that will cause a fire hazard with respect to any flammable fluid vent or drain nor in a location that will cause a glare seriously affecting pilot visibility at night.

(e) Exhaust system components must be ventilated to prevent points reaching an excessively high temperature. Exhaust shrouds must be ventilated or insulated so that, during normal operation, there are no temperatures high enough to ignite any flammable fluids, or vapors, outside of the shrouds.

[Revision note: Combines §§ 4b.467(a) and 4b.467–1 (first sentence)]

§ 25.823 Exhaust piping.

(a) Exhaust piping must be heat and corrosion resistant and must have provisions to prevent failure due to expansion when heated to operating temperatures.

(b) Exhaust piping must be supported to withstand all vibration and inertia loads to which it is subjected in operation. Parts of the exhaust piping that are connected to components between which relative motion could exist must have provisions for flexibility.

[Revision note: Based on § 4b.467(b)]

§ 25.825 Exhaust heat exchangers.

(a) Exhaust heat exchangers must be constructed and installed in a manner that assures their ability to withstand, without failure, all vibration, inertia, and other loads that they are subjected to in operation. They must be constructed of materials that are suitable for continued operation at high temperatures and that resist corrosion from exhaust gas elements.

(b) There must be provisions for the inspection of all critical parts of exhaust heat exchangers.

(c) Exhaust heat exchangers must have cooling provisions wherever they are subject to contact with exhaust gases. Exhaust heat exchangers or muffs may not have stagnant areas, or liquid traps, that would increase the probability of ignition of flammable fluids or vapors that might be present in case of failure or malfunctioning of components carrying flammable fluids.

[Revision note: Based on § 4b.467(c)]

§ 25.827 Exhaust heating of ventilating air.

(a) If exhaust heat exchangers are used for heating ventilating air, there must be a secondary heat exchanger between the primary exhaust gas heat exchanger and the ventilating air system, unless it is shown that there are other means that preclude harmful contamination of the ventilating air.

(b) Any acceptable carbon monoxide detection method may be used to show the absence of carbon monoxide.

[Revision note: Combines §§ 4b.467(d) and 4b.467–1 (first sentence)]

§ 25.829 Exhaust driven turbo-superchargers.

(a) Exhaust driven turbo-superchargers must be approved or must be shown to be suitable for the particular application. They must be installed and supported in a manner that ensures their safe operation between normal inspection and overhaul periods. In addition, there must be provisions for expansion and flexibility between exhaust conduits and the turbine.

(b) There must be provisions for lubricating the turbine and for cooling turbine parts where temperatures are critical.

(c) There must be means so that the normal turbo-supercharger control system malfunctions, the turbine speed will not be greater than its maximum allowable value. Except for the waste gate operating components, the components provided for this purpose must be independent of the normal turbo-supercharger controls.

[Revision note: Based on §4b.467 (less (a) through (d))]

POWERPLANT CONTROLS AND ACCESSORIES

§ 25.841 Powerplant controls; general.

Sections 25.507 through 25.511 apply to all powerplant controls with respect to location, grouping, and direction of motion. Section 25.1205 applies to all powerplant controls with respect to marking. In addition, all powerplant controls must conform to the following:

(a) Controls must be located so that they cannot be inadvertently operated by persons entering, leaving, or normally moving in, the cockpit.

(b) Controls must maintain any set position without constant attention by flight personnel. They may not tend to creep due to control loads or vibration.

(c) Flexible controls must be approved or must be shown to be suitable for the particular application.

(d) Controls must have strength and rigidity to withstand operating loads without failure and without excessive deflection.

[Revision note: Based on § 4b.470]

§ 25.843 Throttle system controls.

(a) There must be a separate throttle control for each engine. Throttle controls must be grouped and arranged to allow separate control of each engine and simultaneous control of all engines.

(b) Throttle controls must give a positive and immediately responsive means of engine control.

[Revision note: Based on § 4b.471 (less (c))]

§ 25.845 Antidetonant injection (A.D.I.) system controls.

If there is an antidetonant injection system, the flow of A.D.I. fluid must be automatically controlled with relation to the amount of power produced by the engine. In addition to the automatic control, there must be a separate control for the A.D.I. pumps.

[Revision note: Based on § 4b.471(c)]

§ 25.847 Ignition switches.

Ignition switches must provide control for each engine ignition circuit on each engine. It must be possible to quickly shut off all ignition either by grouping of the individual switches or by providing a master ignition control. If the system has a master ignition control, it must have a guard to prevent inadvertent operation of the control.

[Revision note: Based on § 4b.472]

§ 25.849 Mixture controls.

(a) If the airplane has mixture controls, each engine must have a separate control. The controls must be grouped and arranged to allow the separate control of each engine and the simultaneous control of all engines.

(b) Any intermediate position of the mixture control that corresponds to a normal operating setting must be identifiable by sight and by feel.

(c) The mixture controls must be accessible to both pilots. However, if there is a separate flight engineer station with a control panel, the mixture controls need be accessible only to the flight engineer.

[Revision note: Based on § 4b.473]

§ 25.851 Propeller speed and pitch controls.

(a) There must be a separate propeller speed and pitch control for each propeller. The controls must be grouped and arranged to allow the separate control of each propeller and the simultaneous control of all propellers. The controls must allow synchronization of all propellers.

(b) The propeller speed and pitch control(s) must be to the right of, and at least one inch lower than, the pilot's throttle controls.

[Revision note: Based on § 4b.474(a)]

§ 25.853 Propeller feathering controls.

(a) There must be a separate propeller feathering control for each propeller. The control must have means to prevent its inadvertent operation.

(b) If feathering is accomplished by movement of the propeller pitch or speed control lever, there must be provisions to prevent the movement of this control to the feathering position during normal operation.

[Revision note: Based on § 4b.474 (less (a))]

§ 25.855 Reverse thrust controls.

Reverse thrust controls must have a means to prevent their inadvertent operation. The means must have a positive lock or stop at the flight idle position and must require a separate and distinct operation by the crew to displace the control from the flight regime (forward thrust regime for the turbojet powered airplanes).

[Revision note: Based on § 4b.474a]

§ 25.857 Fuel jettisoning system controls.

Fuel jettisoning system controls must have guards to prevent inadvertent operation. The controls may not be near the fire extinguisher controls or other controls used to combat fire.

[Revision note: Based on § 4b.475]

§ 25.859 Carburetor air preheat controls.

The airplane must have a separate control for each engine to regulate the temperature of the carburetor air for that engine.

[Revision note: Based on § 4b.476]

§ 25.861 Supercharger controls.

Supercharger controls must be accessible to the pilots. However, if there is a separate flight engineer station with a control panel, the controls need be accessible only to the flight engineer.

[Revision note: Based on § 4b.476a]

§ 25.863 Powerplant accessories.

(a) Engine-mounted accessories must be approved for installation on the engine involved and must use the provisions on the engine for their mounting.

(b) Electrical equipment subject to arcing or sparking must be installed in a manner that minimizes the probability of contact with any flammable fluids or vapors that might be present in a free state.

(c) If continued rotation of an engine-driven cabin supercharger or of any remote accessory driven by the engine is hazardous if malfunctioning occurs, there must be a means to prevent rotation of this kind of accessory without interfering with the continued operation of the engine.

[Revision note: Based on § 4b.477]

§ 25.865 Engine ignition systems.

(a) Battery ignition systems must be supplemented by a generator that is automatically made available as an alternate source of electrical energy to allow continued engine operation if any battery becomes depleted.

(b) The capacity of batteries and generators must be large enough to meet the simultaneous demands of the engine ignition system and the greatest demands of any of the airplane's electrical system components that draw electrical energy from the same source.

(c) The design of the engine ignition system must consider—

(1) The condition of an inoperative generator;

(2) The condition of a completely depleted battery with the generator running at its normal operating speed; and

(3) The condition of a completely depleted battery with the generator operating at idling speed, if there is only one battery.

(d) The parts of magneto ground wires (for separate ignition circuits) that lie on the engine side of the fire wall, must be installed, located, or protected, so that the probability of simultaneous failure of two or more wires as a result of mechanical damage, electrical faults, or similar causes is minimized. Engine ground wires, except those associated with the engine that the wires serve, may not be routed through fire zones unless those parts of the wires that are in the fire zones are fireproof or are protected against the possibility of damage by fire in a manner equivalent to making them fireproof.

(e) Ignition circuits must be electrically independent of all other electrical circuits except those circuits used for analyzing the operation of the ignition system.

(f) The airplane must have means to warn flight personnel if malfunctioning of any part of the electrical system is causing the continuous discharge of a battery that is necessary for engine ignition.

[Revision note: Based on § 4b.478]

POWERPLANT FIRE PROTECTION

§ 25.871 Designated fire zones.

(a) The following areas of the airplane are designated fire zones:

(1) Engine power section.

(2) Engine accessory section.

(3) Complete powerplant compartments in which there is no isolation between the engine power section and the engine accessory section.

(4) Auxiliary power unit compartments.

(5) Fuel-burning heaters and other combustion equipment installations specified in § 25.593.

(6) Compressor and accessory sections of turbine engines.

(7) Combustor, turbine, and tailpipe sections of turbine engine installations that contain lines or components carrying flammable fluids or gases. However, if it is shown that a fire occurring in these sections can be otherwise controlled, the fire extinguisher system specified in § 25.879 is not required.

(b) Designated fire zones must be protected from fire in accordance with §§ 25.873 through 25.895.

(c) The nacelle area immediately behind the fire wall must meet the requirements of §§ 25.591, 25.807(b), 25.865(d), 25.873(c), 25.875 through 25.887, and 25.893. If there is a retractable landing gear in this area, compliance with this paragraph is required only with the landing gear retracted.

[Revision note: Based on § 4b.480]

§ 25.873 Flammable fluids.

(a) No tank or reservoir that is a part of a system containing flammable fluids or gases may be in designated fire zones unless the fluid contained, the design of the system, the materials used in the tank, the shutoff means, and all connections, lines, and controls, provide a degree of safety equal to that where there are none of these tanks or reservoirs in designated fire zones.

(b) There may not be less than one-half inch of clear airspace between any tank or reservoir and a firewall or shroud isolating a designated fire zone.

(c) If absorbent materials are located in proximity to flammable fluid system components that might leak, the absorbent materials must be covered or treated to prevent the absorption of hazardous quantities of fluids.

[Revision note: Based on § 4b.481]

§ 25.875 Shutoff means.

(a) Each engine and each fire zone specified in § 25.871(a) (4) and (5) must have a means to shut off or otherwise prevent hazardous quantities of fuel, oil, deicer, and other flammable fluids, from flowing into, within, or through any designated fire zone, except in lines forming an integral part of an engine. Closing the fuel shutoff valve for any engine must not make any of the fuel supply unavailable to the remaining engines.

(b) Operation of the shutoff means may not interfere with the subsequent emergency operation of other equipment, such as feathering the propeller.

(c) The shutoff means must be outside of designated fire zones, unless an equally high degree of safety is provided for a location inside the designated fire zone. It must be shown that no hazardous quantity of flammable fluid could drain into any designated fire zone after shutoff has been accomplished.

(d) There must be provisions to guard against inadvertent operation of the shutoff means and to make it possible for the crew to reopen the shutoff means in flight after it has been closed.

[Revision note: Based on § 4b.482]

§ 25.877 Lines and fittings.

(a) Lines and fittings carrying flammable fluids in designated fire zones must be fire resistant except—

(1) Lines and fittings that form an integral part of the engine; and

(2) Vent lines, drain lines, and their fittings, the failure of which will not result in, or add to, a fire hazard.

(b) If flexible hose is used, the assembly of hose and end fittings must be approved.

[Revision note: Based on § 4b.483]

§ 25.879 Fire extinguisher systems.

(a) The airplane must have a fire extinguisher system serving all designated fire zones.

(b) An individual "one shot" fire extinguishing system may be used for auxiliary power units, fuel-burning heaters, and other combustion equipment. The fire extinguishing system, the quantity of extinguishing agent, and the rate of discharge, in all other designated fire zones must be able to provide two adequate discharges.

(c) The fire-extinguishing system for a nacelle must be able to simultaneously protect all zones of the nacelle for which protection is provided.

[Revision note: Based on § 4b.484 (less (b), (c), (d), and (e))]

§ 25.881 Fire extinguishing agents.

(a) Methyl bromide, carbon dioxide, or any other agent that has been shown to provide equivalent extinguishing action may be used as an extinguishing agent.

(b) If methyl bromide, carbon dioxide, or any other toxic extinguishing agent is used, provisions must be made to prevent harmful concentrations of fluid or fluid vapors (from leakage during normal operation of the airplane or as a result of discharging the fire extinguisher on the ground or in flight) from entering any personnel compartment, even though a defect may exist in the extinguishing system. Except as provided in paragraph (d) of this section, compliance with this requirement must be shown by appropriate tests.

(c) In addition to the requirements of paragraph (b) of this section, if methyl bromide is used as the extinguishing agent, the methyl bromide containers must be charged with a dry agent, and must be sealed by persons using appropriate recharging equipment.

(d) The tests required by paragraph (b) of this section need not be made for aircraft with built-in carbon dioxide fuselage compartment fire extinguishing systems if—

(1) Five pounds or less of carbon dioxide will be discharged, in accordance with established fire control procedures, into any one fuselage compartment; or

(2) Protective breathing equipment is provided for each flight crew member on flight deck duty.

[Revision note: Combines §§ 4b.484(b) and 4b.484-1 (18th through 30th words of paragraph (a) and subparagraphs (a) (1) and (2))]

§ 25.883 Extinguishing agent containers.

(a) Extinguishing agent containers must have pressure relief means to prevent bursting of the container due to excessive internal pressures. In addition—

(1) The discharge line from the pressure relief means must terminate outside the airplane in a location convenient for inspection on the ground; and

(2) There must be an indicator at the discharge end of the extinguishing agent container to provide visual indication when the container has discharged.

(b) Under all intended airplane operating conditions, the temperature range of the extinguishing agent containers must be maintained to ensure that the pressure in the containers can neither fall below the minimum necessary to provide an adequate rate of extinguisher agent discharge nor rise above a safe limit so that the system will prematurely discharge.

[Revision note: Based on § 4b.484 (c) and (d)]

§ 25.885 Fire extinguishing system materials.

(a) No materials that might chemically react with the extinguishing agent to create a hazard to the airplane or its occupants may be used in the fire extinguishing system.

(b) Components of the fire extinguishing system in designated fire zones must be fireproof.

[Revision note: Based on § 4b.484 (less (a) through (d))]

§ 25.887 Fire detector system.

(a) There must be a sufficient number of suitably located quick-acting approved fire or overheat detectors in all designated fire zones, and in the combustion, turbine, and tailpipe sections of turbine engine installations, to ensure prompt detection of fires. In addition—

(1) Fire detectors must be constructed and installed to ensure their ability to resist, without failure, all vibration, inertia, and other loads that they are subjected to in operation;

(2) Fire detectors may not be affected by exposure to oil, water, or other fluids or fumes, that might be present;

(3) The fire detector system must have a means to allow the crew to check the functioning of the associated electric circuit in flight; and

(4) Components of the fire detector system (including wiring) that are in fire zones, must be fire-resistant.

(b) Except for fire detector system components passing through zones that are simultaneously protected by the same detector and extinguisher systems, detector system components for one zone may not pass through another unless they are protected against the possibility of false warnings resulting from fires in zones through which they pass.

[Revision note: Based on § 4b.485]

§ 25.889 Firewalls.

All engines, auxiliary power units, fuel-burning heaters, other combustion equipment intended for operation in flight, and the combustion, turbine, and tailpipe sections of turbine engines, must be isolated from the remainder of the airplane by means of firewalls, shrouds, or equivalent means. In addition, the fire walls and shrouds must be—

(a) Fireproof;

(b) Constructed so that hazardous quantities of air, fluids, or flame, can not pass from the compartment to other parts of the airplane;

(c) Constructed so that all openings are sealed with close fitting fireproof grommets, bushings, or firewall fittings; and

(d) Protected against corrosion.

[Revision note: Based on § 4b.486]

§ 25.891 Cowling and nacelle skin.

(a) Cowling must be constructed and supported so that it is able to resist all vibration, inertia, and air loads that it is subjected to in operation.

(b) Cowling must have the drainage and ventilation provisions prescribed in § 25.893.

(c) On airplanes with a diaphragm isolating the engine power section from the engine accessory section, the parts of the accessory section cowling that might be subjected to flame if a fire occurs in the engine power section of the nacelle must be fireproof and must meet the provisions of § 25.889.

(d) Those parts of the cowling that are subjected to high temperatures because of their proximity to exhaust system parts or because of exhaust gas impingement must be fireproof.

(e) The airplane must be designed and constructed so that, if a fire starts in the engine power or accessory sections, the probability of the fire entering (either through openings in, or by burning through, the external skin) any other zone of the nacelle where it could create additional hazards, is extremely remote. For airplanes with retractable landing gear, this must be shown with the landing gear retracted. Fireproof materials must be used for all nacelle skin areas that might be subjected to flame if a fire starts in the engine power or accessory sections.

[Revision note: Based on § 4b.487]

§ 25.893 Drainage and ventilation of fire zones.

(a) In order to minimize the hazards resulting from failure or malfunction of components containing flammable fluids, all parts of designated fire zones must have complete drainage provisions that are effective under the conditions expected to prevail when drainage is needed. The drainage provisions must be arranged so that the discharged fluid will not cause an additional fire hazard.

(b) All designated fire zones must be ventilated to prevent the accumulation of flammable vapors. The ventilation openings may not be located where flammable fluids, vapors, or flames, from other zones may enter the opening. The ventilation provisions must be arranged so that the discharged vapor will not cause an additional fire hazard.

(c) Unless the extinguishing agent capacity and rate of discharge are based on maximum air flow through a zone, there must be provisions to allow the crew to shut off sources of forced ventilation to any fire zones except the engine power section of the nacelle and the combustion heater ventilating air ducts.

[Revision note: Based on §4b.489]

§ 25.895 Protection from fire of other airplane components.

Airplane surfaces to the rear of the nacelles, within one nacelle diameter of the nacelle centerline, must be fire-resistant. This provision does not apply to tail surfaces that are to the rear of the nacelles unless those surfaces could be readily affected by heat, flames, or sparks coming from a designated fire zone or engine compartment of any nacelle.

[Revision note: Based on §4b.490]

Subpart F—Equipment

§ 25.941 Equipment; general.

(a) The equipment listed in §§ 25.943 through 25.947 is required basic equipment and must be installed in the airplane prior to certification. Any additional equipment necessary for a specific type of operation is prescribed in the operating rules of this subchapter.

(b) Each item of equipment must be—

(1) Of a kind and design appropriate for its intended function;

(2) Labeled as to its identification, function, or operational limitations, or any applicable combination of these factors;

(3) Installed in accordance with specified limitations of the equipment; and

(4) Shown to function properly in the airplane.

[Revision note: Combines §§ 4b.600, 4b.601, and 4b.602]

§ 25.943 Flight and navigational instruments.

(a) The required flight and navigational instruments are as follows:

(1) An airspeed indicating system. If the airspeed limitations vary with altitude, the airspeed indicator must have a maximum allowable airspeed indication showing the variation of V_{MO}/M_{MO} with (i) altitude and (ii) compressibility limitations.

(2) An altimeter (sensitive or precision).

(3) A rate-of-climb indicator (vertical speed).

(4) A free air temperature indicator.

(5) A clock (sweep-second pointer).

(6) A rate-of-turn indicator (gyroscopic, with integral bank or slip indicator).

(7) A bank and pitch indicator (gyroscopically stabilized).

(8) A direction indicator (gyroscopically stabilized, magnetic or nonmagnetic).

(9) A direction indicator (nonstabilized magnetic compass).

(10) A machmeter (for airplanes with compressibility limitations not otherwise indicated in accordance with § 25.1195 to the pilot).

(11) A speed warning device (for all turbine-powered airplanes and for all other airplanes with V_{MO}/M_{MO} greater than 0.8 V_{DF}/M_{DF} or 0.8 V_D/M_D).

(b) The speed warning device required by subparagraph (a)(11) of this section must give effective aural warning (differing distinctively from aural warnings used for other purposes) to the pilots, whenever the speed exceeds V_{MO} plus six knots or $M_{MO}+0.01$. The upper limit of the production tolerance for the warning device may not be a speed greater than the prescribed warning speed.

[Revision note: Based on § 4b.603]

§ 25.945 Powerplant instruments.

The required powerplant instruments are as follows:

(a) A carburetor air temperature indicator for each reciprocating engine.

(b) A cylinder head temperature indicator for each air-cooled reciprocating engine.

(c) A gas temperature indicator for each turbine engine.

(d) A manifold pressure indicator for each reciprocating engine.

(e) A fuel pressure indicator (to indicate the pressure at which the fuel is supplied) for each reciprocating engine.

(f) A fuel pressure warning means for each engine, or a master warning means for all engines with provision for isolating the individual warning means from the master warning means.

(g) A fuel flowmeter indicator for each turbine engine.

(h) A fuel flowmeter, or fuel mixture indicator, for each reciprocating engine without an automatic altitude mixture control.

(i) A fuel quantity indicator for each fuel tank.

(j) An augmentation liquid quantity indicator (appropriate for the manner in which the liquid is to be used in operations) for each tank.

(k) An oil quantity indicator for each oil tank.

(l) An oil pressure indicator for each independent pressure oil system of each engine.

(m) An oil pressure warning means for each engine, or a master warning means for all engines with provision for isolating the individual warning means from the master warning means.

(n) An oil temperature indicator for each engine.

(o) A tachometer for each reciprocating engine.

(p) A tachometer (to indicate the speed of the rotors with established limiting speeds) for each turbine engine.

(q) Fire-warning indicators.

(r) An indicator to indicate a change in thrust resulting from any deficiency in the engine, or an indicator to indicate a gas stream pressure that can be related to thrust, for each turbojet engine.

(s) A torque indicator for each turbo propeller engine.

(t) A device that indicates (to the flight crew during flight) any change in the power output, for each reciprocating engine with—

(1) An automatic propeller feathering system, the operation of which is initiated by a power output measuring system; or

(2) A total engine piston displacement of 2,000 cubic inches or more.

(u) Position indicating means to indicate to the flight crew when the propeller blade angle is below the flight low pitch position, for each turbo propeller engine propeller.

(v) A means to indicate to the pilot when the propeller is in reverse pitch, for each reversing propeller of reciprocating engines.

(w) A position indicating means to indicate to the flight crew when the thrust reversing device is in the reverse thrust position, for each turbine engine using a thrust reversing device.

[Revision note: Based on § 4b.604]

§ 25.947 Miscellaneous equipment.

The required miscellaneous equipment is as follows:

(a) An approved seat for each occupant.

(b) An approved safety belt for each occupant.

(c) Source(s) of electrical energy.

(d) Electrical protective devices.

(e) A radio communication system (two-way).

(f) A radio navigation system.

(g) A windshield wiper, or equivalent, for each pilot.

(h) An ignition switch for each engine.

(i) An approved portable fire extinguisher.

[Revision note: Based on § 4b.605]

§ 25.949 Equipment systems and installations.

(a) All equipment, systems, and installations, that must function properly in order to show compliance with the provisions of this subchapter, must be designed and installed so that they will perform their intended functions reliably under all reasonably foreseeable operating conditions.

(b) All equipment, systems, and installations, must be designed to safeguard against hazards to the airplane if they malfunction or fail.

(c) Each installation that must function properly in order to show compliance with the regulations of this subchapter, and that requires a power supply, is an essential load on the power supply. The power sources and the power system must be able to supply, in probable operating combinations and for probable durations, all—

(1) Loads connected to the system with the system functioning normally;

(2) Essential loads after failure of any one prime mover, power converter, or energy storage device; and

(3) Essential loads after failure of any one engine on two- or three-engine airplanes, or after failure of any two engines on four-or-more-engine airplanes.

(d) In determining the probable operating combinations and durations of essential loads for the partial power failure conditions prescribed in subparagraphs (2) and (3) of paragraph (c) of this section, it may be assumed that the power loads are reduced in accordance with a monitoring procedure that is consistent with safety in the types of operations authorized. If a particular load is not required to maintain controlled flight, it need not be considered for the two-engine-inoperative condition on airplanes with four or more engines.

[Revision note: Based on § 4b.606]

INSTRUMENTS; INSTALLATION

§ 25.961 Arrangement and visibility requirements of instrument installations; general.

(a) Duplicate instrument arrangements at two or more crew stations may be used—

(1) To meet the instrument visibility requirements of this section; and

(2) If required by the operating rules of this chapter for reliability, or cross-check purposes, in particular kinds of operations.

(b) Flight, navigation, and powerplant instruments for use by each pilot must be plainly visible to him from his station with the minimum practicable deviation from his normal position and line of vision when he is looking out and forward along the flight path.

(c) The flight instruments required by § 25.943 must be grouped on the instrument panel and centered as nearly as practicable about the vertical plane of the pilot's forward vision. In addition—

(1) The instrument that most effectively indicates attitude must be located on the panel in the top center position;

(2) The instrument that most effectively indicates airspeed must be located on the panel in the position adjacent to and directly to the left of the instrument in the top center position;

(3) The instrument that most effectively indicates altitude must be located on the panel in the position adjacent to and directly to the right of the instrument in the top center positions; and

(4) The instrument that most effectively indicates direction of flight must be located on the panel in the position adjacent to and directly below the instrument in the top center position.

(d) All required powerplant instruments must be closely grouped on the instrument panel so that—

(1) The location of identical powerplant instruments for the engines prevents confusion as to which engine each instrument relates; and

(2) Powerplant instruments vital to the safe operation of the airplane are plainly visible to the appropriate crewmembers.

(e) Vibration of the instrument panel may not seriously impair the accuracy of the instruments nor damage them.

[Revision note: Combines §§ 4b.610 and 4b.611]

§ 25.963 Airspeed indicating systems.

(a) Airspeed indicating instruments must be approved. They must be calibrated to indicate true airspeed at sea level in standard atmosphere with a minimum practicable instrument calibration error when the corresponding pitot and static pressures are applied to the instrument.

(b) The airspeed indicating system must be calibrated to determine the system error (that is, the relation between IAS and CAS) in flight and during the accelerated takeoff ground run. The ground run calibration must be determined—

(1) From 0.8 of the minimum value of V_1 to the maximum value of V_2, considering the approved ranges of altitude and weight; and

(2) With the flap and power settings corresponding to the values determined in the establishment of the takeoff path under the provisions of § 25.45 or § 25.77, assuming that the critical engine fails at the minimum approved value of V_1.

(c) The airspeed error of the installation, excluding the airspeed indicator instrument calibration error, may not exceed three percent or five mph, whichever is greater, throughout the speed range, from—

(1) V_{MO} to 1.3 V_{S_1} with flaps retracted; and

(2) 1.3 V_{S_0} to V_{FE} with flaps in the landing position.

(d) The airspeed indicating system must be arranged, as far as practicable, in a manner that precludes malfunctioning, or serious error, due to the entry of moisture, dirt, or other substances. In addition, the airspeed indicating system must have a means to heat the pitot tube or an equivalent means for preventing its malfunction due to icing.

(e) Where duplicate airspeed indicators are required, their respective pitot tubes must be spaced far enough apart to avoid damage to both tubes in a collision with a bird.

[Revision note: Based on § 4b.612(a)]

§ 25.965 Static air vent and pressure altimeter systems.

(a) Instruments with static air case connections must be vented to the outside atmosphere through an appropriate piping system. The vents must be on the airplane where the vent orifices are least affected by airflow variation, moisture, or other foreign matter. Except for the vent into the atmosphere, the system must be airtight.

(b) Pressure altimeters must be approved. They must be calibrated to indicate pressure altitude in standard atmosphere, with a minimum practicable instrument calibration error when the corresponding static pressures are applied to the instrument.

(c) The altimeter system must be designed and installed so that the error in indicated pressure altitude, at sea level, in standard atmosphere, and excluding instrument calibration error, does not result in an error of more than ±30 feet per 100 knots speed for the appropriate configuration in the speed range between 1.3 V_{S_0} with flaps extended and 1.8 V_{S_1} with flaps retracted. However, the error need not be less than ±30 feet.

[Revision note: Based on § 4b.612(b)]

§ 25.967 Magnetic direction indicator.

The magnetic direction indicator must be installed so that its accuracy is not excessively affected by the airplane's vibration or magnetic fields of a permanent or transient nature. In addition, the magnetic direction indicator must be installed so that, after it has been compensated, the deviation in level flight does not exceed ±10 degrees on any heading.

[Revision note: Based on § 4b.612(c)]

§ 25.969 Automatic pilot system.

If an automatic pilot system is installed, it must be approved and must conform to the following:

(a) The system must be designed so that the automatic pilot can be quickly and positively disengaged by the human pilots to prevent it from interfering with their control of the airplane.

(b) The system must have a means to readily indicate to the pilot the alignment of the actuating device in relation to the control system it operates, unless it has automatic synchronization.

(c) The manually operated controls for the system's normal operation must be readily accessible to the pilots. The quick release (emergency) controls must be installed on both of the pilots' control wheels, on the side of the wheel opposite from the throttles. Attitude controls must operate in the plane and sense of motion specified in §§ 25.507(b) and 25.509(a) for cockpit controls. The direction of motion must be plainly indicated on, or adjacent to, each control.

(d) The automatic pilot system must be designed and adjusted so that, within the range of adjustment available to the human pilot, it cannot produce hazardous loads on the airplane, or create hazardous deviations in the flight path, under any condition of flight appropriate to its use, either during normal operation or in the event of a malfunction, assuming that corrective action is initiated within a reasonable period of time.

(e) If the automatic pilot integrates signals from auxiliary controls or furnishes signals for operation of other equipment, positive interlocks, and sequencing of engagement, to preclude improper operation are required. Protection against adverse interaction of integrated components, resulting from a malfunction, is also required.

[Revision note: Based on § 4b.612(d)]

§ 25.971 Instruments utilizing a power supply.

(a) Each rate-of-turn, bank and pitch, and direction indicator required by § 25.943(a) (6), (7), and (8), that uses a power supply, must conform to the following:

(1) Each instrument must have a visual means of indicating power failure integral with, or located adjacent to, the instrument, to indicate when power adequate to sustain proper instrument performance is not being supplied to the instrument. The power must be measured at or near the point where it enters the instruments. For electric instruments, the power is considered to be adequate when the voltage is within approved limits.

(2) Each instrument must have two independent power sources and a means for selecting either power source. If duplicate independent instruments are installed, power source selection means are not required if each instrument has an independent power source.

(3) Each instrument and its related power supply system must be designed and installed so that the failure of one instrument, or the failure of the energy supply from one source, or a fault in any part of the power distribution system, does not interfere with the proper supply of energy from the other source.

(b) As used in this section, the word "instrument" includes those devices that are physically contained in one unit, and those devices that are composed of two or more physically separate units or components connected together (such as a remote indicating gyroscopic direction indicator that includes a magnetic sensing element, a gyroscopic unit, an amplifier, and an indicator connected together).

[Revision note: Based on § 4b.612(e)]

§ 25.973 Duplicate instrument systems.

To be eligible for operation under operating rules of this chapter that require duplicate instrument systems, the airplane must conform to the following:

(a) The operating system for flight instruments for the pilot in command must be completely independent from the operating system for duplicate flight instruments required at other flight crew stations.

(b) Only the required flight instruments, and duplicates of required instruments, for use by the pilot in command may be connected to the operating system for the flight instruments for the pilot in command.

(c) If instruments and duplicates other than those required by this subchapter are connected to the operating system for instruments at other than the station of the pilot in command, there must be provisions to disconnect or isolate these instruments and duplicates, in flight.

[Revision note: Based on § 4b.612 (less (a) through (e))]

§ 25.975 Powerplant instrument lines.

Powerplant instrument lines carrying flammable fluids or gases under pressure, must have orifices, or equivalent safety devices, at the source of the pressure, to prevent the escape of excessive fluid or gas in case of line failure. In addition, §§ 25.723 and 25.725 apply.

[Revision note: Based on § 4b.613(a)]

§ 25.977 Fuel quantity indicator.

(a) The airplane must have a means to indicate to the flight crew, in flight, the quantity of usable fuel, in gallons or pounds, in each tank. In addition—

(1) Exposed sight gauges must be protected from damage; and

(2) Fuel quantity indicators must be calibrated to read zero during level flight, when the quantity of fuel remaining in the tank is equal to the unusable fuel supply computed in accordance with § 25.677.

(b) Tanks with interconnected outlets and airspaces may be considered as one tank and need not have separate indicators.

[Revision note: Based on § 4b.613(b)]

§ 25.979 Fuel flowmeter system.

If a fuel flowmeter is installed, the metering component must have a means for bypassing the fuel supply if a malfunction of the metering component severely restricts fuel flow.

[Revision note: Based on § 4b.613(c)]

§ 25.981 Oil quantity indicator.

The airplane must have a stick gauge or equivalent means to indicate the quantity of oil in each tank. If an oil transfer or reserve oil supply system is installed, there must be a means to indicate to the flight crew, in flight, the quantity of oil in each tank.

[Revision note: Based on § 4b.613(d)]

§ 25.983 Turbopropeller blade position indicating means.

The required position indicating means for turbopropeller blades must begin indicating before the propeller blade has moved more than eight degrees below the flight low pitch stop. The source of indication must directly sense the blade position.

[Revision note: Based on § 4b.613(e)]

§ 25.985 Fuel pressure indication.

(a) The airplane must have provisions to measure the fuel pressure in all systems supplying reciprocating engines, at a point downstream of all fuel pumps except fuel injection pumps.

(b) If necessary for the maintenance of proper fuel delivery pressure, there must be a connection to transmit the carburetor air intake static pressure to the proper pump relief valve connection. If a connection for this purpose is required, the gauge balance lines must be independently connected to the carburetor inlet pressure in order to avoid erroneous fuel pressure reading.

[Revision note: Based on § 4b.613 (less (a) through (e))]

ELECTRICAL SYSTEMS AND EQUIPMENT

§ 25.1001 The electrical system capacity.

The generating capacity, and the number and kinds of power sources, required for the airplane must be determined by an electrical load analysis. In addition, § 25.949(c) applies.

[Revision note: Based on § 4b.621]

§ 25.1003 Generating system.

(a) The generating system includes electrical power sources, main power busses, transmission cables, and associated control, regulation, and protective devices. It must be designed so that—

(1) The power sources function properly when independent and when connected in combination;

(2) The failure or malfunctioning of any power source cannot create a hazard or impair the ability of the remaining sources to supply essential loads;

(3) The system voltage and frequency (as applicable) at the terminals of all essential load equipment can be maintained within the limits for which the equipment is designed, during any probable operating condition; and

(4) System transients initiated by switching, fault clearing, or other causes, do not make essential loads inoperative, and do not introduce a smoke or fire hazard.

(b) The airplane must have a means to allow appropriate crewmembers to independently disconnect, in flight, each electrical power source from the system. This means must be grouped to allow expeditious disconnection of all electrical power sources.

(c) The airplane must have a means to indicate to appropriate crewmembers the generating system quantities (including the voltage and current supplied by each generator) that are essential for the safe operation of the system.

[Revision note: Based on § 4b.622]

§ 25.1005 Distribution system.

(a) The distribution system includes all distribution busses, their associated feeders, and control and protective devices. Distribution systems must be designed to assure that essential load circuits can be supplied in the event of reasonably probable faults or open circuits.

(b) If two independent sources of electrical power for particular equipment or systems are required by this chapter, their electrical energy supply must be ensured by means such as duplicate electrical equipment, throwover switching, or multi-channel or loop circuits separately routed.

[Revision note: Based on § 4b.623]

§ 25.1007 Electrical protection.

(a) Automatic protective devices must be used to minimize distress to the electrical system, and hazard to the airplane, in the event of wiring faults or serious manfunctioning of the system or connected equipment.

(b) The protective and control devices in the generating system must be designed to de-energize and disconnect faulty power sources and power transmission equipment from their associated busses with sufficient rapidity to provide protection from hazardous over-voltage and other malfunctioning.

(c) Resettable type circuit protective devices must be designed so that, when an overload or circuit fault exists, they will open the circuit irrespective of the position of the operating control.

(d) If it is essential to safety in flight to be able to reset a circuit breaker or replace a fuse, the circuit breaker or fuse must be identified, and located, so that it can readily be reset or replaced in flight.

(e) Circuits for essential loads must have individual circuit protection. However, individual protection for each circuit in an essential load system (such as each position light in a system) is not required.

(f) If fuses are used, spare fuses equal in number to at least 50 percent of the number of fuses of each rating required for complete circuit protection must be available in flight.

(g) Automatic reset circuit breakers may be used as integral protectors for electrical equipment (such as thermal cut-outs) if there is circuit protection to protect the cable to the equipment.

[Revision note: Combines §§ 4b.624 and 4b.624–1 (less first sentence)]

§ 25.1009 Electrical system and equipment design and installation.

(a) In showing compliance with the provisions of § 25.949 (a) and (b) with regard to the electrical system and equipment design and installation, critical environmental conditions must be considered. For all electrical generation, distribution, and utilization equipment required by or used in complying with the applicable rules in this chapter, except equipment covered by Technical Standard Orders containing environmental test procedures, the ability to provide continuous, safe service under foreseeable environmental conditions may be shown by means of environmental tests, design analysis, or reference to previous comparable service experience on other aircraft.

(b) Electrical equipment controls and wiring must be installed so that operation of any one unit or system of units will not adversely affect the simultaneous operation of any other electrical unit, or system of units, that is essential to the safe operation of the airplane.

(c) Cables must be grouped, routed, and spaced, so that damage to essential circuits will be minimized if there are faults in heavy current-carrying cables.

(d) Storage batteries must be designed and installed so that—

(1) Safe cell temperatures and pressures are maintained during any probable charging or discharging condition;

(2) No uncontrolled increase in cell temperature results when the storage battery is recharged (after previously being completely discharged) at the maximum regulated voltage, during a flight of maximum duration, and under the most adverse cooling conditions likely to occur in service;

(3) Explosive or toxic gases emitted by the storage battery in normal operation, or as the result of any probable malfunction in the charging system or battery installation, do not accumulate in hazardous quantities within the airplane; and

(4) Corrosive fluids or gases that may be emitted or spilled from the storage battery do not damage the surrounding airplane structure or adjacent essential equipment.

(e) Unless satisfactory operating experience with similar batteries and installations has shown that there is no problem in maintaining safe cell temperatures and pressures, compliance with the requirement of subparagraphs (d) (1) and (2) of this section must be shown by tests.

[Revision note: Combines §§ 4b.625 and 4b.625–1 (introductory paragraphs) (first sentence)]

§ 25.1011 Electrical system fire and smoke protection.

Components of the electrical system must be designed and installed so that they conform to the applicable fire and smoke protection requirements of §§ 25.561(c), 25.591, and 25.895. In addition, all electrical cables, terminals, and equipment, in designated fire zones, that are used during emergency procedures, must be fire-resistant or must—

(a) Withstand, without adverse effect on their circuit function, a 2,000° F. oxidizing flame impinging on their surfaces for at least five minutes; or

(b) Be shown to withstand, without adverse effect on their circuit function, exposure to the probable fire conditions at the particular location for at least five minutes.

[Revision note: Combines §§ 4b.626 and 4b.626–1 (first sentence)]

§ 25.1013 Electrical system tests.

(a) Unless the conditions of flight can be adequately simulated in a suitable mockup or by ground tests on the airplane, flight tests of the electrical system must be made.

(b) If a mockup is used, the mockup must have the same generating equipment as the airplane. The equipment must simulate the electrical characteristics of the distribution wiring and connected loads to the extent necessary for valid test results. Mockup generator drives must simulate the actual prime movers on the airplane, with respect to their reaction to generator loading, including loading due to faults.

[Revision note: Based on § 4b.627]

§ 25.1015 Lightning strike protection.

The parts of the airplane that are electrically insulated from the basic airframe must be connected to it through lightning arrestors unless it is shown that a lightning strike on the insulated part—

(a) Is improbable because of the shielding afforded by other parts of the airplane; or

(b) Is not hazardous to the airplane or its occupants.

[Revision note: Based on § 4b.628]

LIGHTS

§ 25.1021 Instrument lights.

(a) Instrument lights must provide enough illumination to make all instruments, switches, and similar devices, easily readable. They must be installed so that their direct rays are shielded from the pilot's eyes and so that no objectionable reflections are visible to him.

(b) Unless it is shown that undimmed instrument lights are satisfactory under all expected conditions of flight, there must be a means to control the intensity of illumination.

[Revision note: Based on § 4b.630]

§ 25.1023 Landing lights.

(a) Landing lights must be approved. They must be installed so that there is no objectionable glare visible to the pilot and so that he is not adversely affected by halation. They must provide the necessary illumination for night landing.

(b) Except when one switch is used for all lights of a multiple light installation at one location, there must be a separate switch for each light.

(c) The airplane must have a means to indicate to the pilots when the landing lights are extended.

[Revision note: Based on § 4b.631]

§ 25.1025 Position light system installation.

(a) The position light system must have the following lights:

(1) Forward position lights consisting of a red and a green light spaced laterally as far apart as practicable. The lights must be installed in a forward location on the airplane so that, with the airplane in normal flying position, the red light is displayed on the left side and the green light is displayed on the right side. The individual lights must be approved.

(2) A rear position white light, mounted as far aft as practicable. The light must be approved.

(b) The light covers or color filters must be flame resistant and may not change color or shape or suffer any appreciable loss of light transmission during normal use.

(c) An additional steady red light (commonly known as a passing light) may be installed if it is located—

(1) Within the left landing light unit;

(2) On the centerline of the airplane nose; or

(3) In the leading edge of the left wing, outboard of the propeller disc.

[Revision note: Combines §§ 4b.632 and 4b.632-1 (1st sentence)]

§ 25.1027 Position light system dihedral angles.

The forward and rear position lights, as installed, must show unbroken light within dihedral angles specified in this section.

(a) Dihedral angle *L* (left) is formed by two intersecting vertical planes, one parallel to the longitudinal axis of the airplane and the other at 110 degrees to the left of the first, looking forward along the longitudinal axis.

(b) Dihedral angle *R* (right) is formed by two intersecting vertical planes, one parallel to the longitudinal axis of the airplane and the other at 110 degrees to the right of the first, looking forward along the longitudinal axis.

(c) Dihedral angle *A* (aft) is formed by two intersecting vertical planes making angles of 70 degrees to the right and 70 degrees to the left, looking aft along the longitudinal axis, to a vertical plane passing through the longitudinal axis.

[Revision note: Based on § 4b.633]

§ 25.1029 Position light distribution and intensities.

(a) *General.* This section applies to the light distribution and intensities of position lights. The intensities prescribed are for new equipment with all light covers and color filters in place. Intensities must be determined with the light source operating at a steady value equal to the average luminous output of the light source at the normal operating voltage of the airplane.

(b) *Forward and rear position lights.* The light distribution and intensities of forward and rear position lights are expressed in terms of minimum intensities in the horizontal plane, minimum intensities in any vertical plane, and maximum intensities in overlapping beams, within dihedral angles *L*, *R*, and *A*. They must conform to the following requirements:

(1) *Intensities in horizontal plane.* The intensities in the horizontal plane may not be less than the values in § 25.1031. (The horizontal plane is the plane containing the longitudinal axis of the airplane and is perpendicular to the plane of symmetry of the airplane.)

(2) *Intensities above and below horizontal.* The intensities in any vertical plane may not be less than the appropriate value given in § 25.1033, where *I* is the minimum intensity prescribed in § 25.1031 for the corresponding angles in the horizontal plane. Vertical planes are planes perpendicular to the horizontal plane.

(3) *Overlaps between adjacent signals.* The intensities in overlaps between adjacent signals may not exceed the values in § 25.1035. However, higher intensities in the overlaps may be used with main beam intensities substantially greater than the minima specified in §§ 25.1031 and 25.1033 if the overlap intensities, in relation to the main beam intensities, do not adversely affect signal clarity. When the peak intensity of the forward position lights is more than 100 candles, the maximum overlap intensities between them may exceed the values in § 25.1035 if the overlap intensity in Area A is not more than 10 percent of peak position light intensity and the overlap intensity in Area B is not more than 2.5 percent of peak position light intensity.

[Revision note: Combines §§ 4b.634 and 4b.634-1]

§ 25.1031 Minimum intensities in the horizontal plane of forward and rear position lights.

Dihedral angle (light involved)	Angle from right or left of longitudinal axis, measured from dead ahead	Intensity (candles)
L and *R* (forward red and green).	0° to 10°	40
	10° to 20°	30
	20° to 110°	5
A (Rear white)	110° to 180°	20

[Revision note: Based on figure 4b-18]

§ 25.1033 Minimum intensities in any vertical plane of forward and rear position lights.

Angle above or below horizontal	*Intensity*
0°	1.00 *I*.
0° to 5°	0.90 *I*.
5° to 10°	0.80 *I*.
10° to 15°	0.70 *I*.
15° to 20°	0.50 *I*.
20° to 30°	0.30 *I*.
30° to 40°	0.10 *I*.
40° to 90°	0.05 *I*.

[Revision note: Based on figure 4b-19]

§ 25.1035 Maximum intensities in overlapping beams of forward and rear position lights.

Overlaps	Maximum intensity	
	Area A* (candles)	Area B** (candles)
Green in dihedral angle *L*	10	1
Red in dihedral angle *R*	10	1
Green in dihedral angle *A*	5	1
Red in dihedral angle *A*	5	1
Rear white in dihedral angle *L*	5	1
Rear white in dihedral angle *R*	5	1

*Area A includes all directions in the adjacent dihedral angle that pass through the light source and that intersect the common boundary plane at more than 10 degrees but less than 20 degrees.

**Area B includes all directions in the adjacent dihedral angle that pass through the light source and that intersect the common boundary plane at more than 20 degrees.

[Revision note: Based on figure 4b-20]

§ 25.1037 Position light color specifications.

The colors of the position lights must conform to the following chromaticity coordinates of the International Commission on Illumination:

(a) *Aviation red.*

y is not greater than 0.335.
z is not greater than 0.002.

(b) *Aviation green.*

x is not greater than $0.440-0.320y$.
x is not greater than $y-0.170$.
y is not less than $0.390-0.170x$.

(c) *Aviation white.*

x is not less than 0.350.
x is not greater than 0.540.

$y-y_0$ is not numerically greater than 0.01, y_0 being the y coordinate of the Planckian radiator for which $x_0=x$.

[Revision note: Based on § 4b.635]

§ 25.1039 Riding light.

(a) When a riding (anchor) light is required for a seaplane or amphibian, it must be able to show a white light for at least two miles at night under clear atmospheric conditions.

(b) The riding light must be installed so that it shows the maximum unbroken light practicable when the seaplane or amphibian is moored or drifting on the water. Externally hung lights may be used.

[Revision note: Based on § 4b.636]

§ 25.1041 Anticollision light system.

The airplane must have an anticollision light system consisting of one or more approved anticollision lights. The anticollision lights must be located where the emitted light will not be detrimental to the crew's vision and will not detract from the conspicuity of the position lights. The system must conform to the following requirements:

(a) *Field of coverage.* The system must consist of a light or lights that will afford coverage of all vital areas around the airplane considering its physical configuration and its flight characteristics. The field of coverage must extend in all directions within 30° above and 30° below the horizontal plane of the airplane, except that a solid angle or angles of obstructed visibility totaling not more than 0.03 steradians is allowable within a solid angle equal to 0.15 steradians centered about the longitudinal axis in the rearward direction.

(b) *Flashing characteristics.* The system (including the number of light sources, beam width, speed of rotation, and similar characteristics) must be arranged to give an effective flash frequency of not less than 40 and not more than 100 cycles per minute. The effective flash frequency is the frequency at which the airplane's complete anticollision light system is observed from a distance, and applies to all sectors of light including the overlaps that might exist when the system consists of more than one light source. In overlaps, flash frequencies above 100 cycles per minute, but not above 180 cycles per minute, are allowable.

(c) *Color.* The color of the anticollision lights must be aviation red, in accordance with the specifications of § 25.1037(a).

(d) *Light intensity.* The minimum light intensities in all vertical planes, measured with the red filter and expressed in term of "effective intensities" are as follows:

(1)

Angle above or below horizontal plane	*Effective intensity (candles)*
0° to 5°	100
5° to 10°	60
10° to 20°	20
20° to 30°	10

(2) The following relation is assumed:

$$I_e = \frac{\int_{t_1}^{t_2} I(t)\,dt}{0.2 + (t_2 - t_1)}$$

where—

I_e=effective intensity (candles);
$I(t)$=instantaneous intensity as a function of time; and
$t_2 - t_1$=flash time interval (seconds).

[Revision note: Combines § 4b.637 and figure 4b-27]

SAFETY EQUIPMENT

§ 25.1051 Ice protection.

(a) If compliance with the provisions of this section is shown, the type certificate will include certification with ice protection provisions.

(b) To be eligible for certification with ice protection provisions, the airplane must be able to safely operate in continuous maximum and intermittent maximum icing conditions determined in accordance with Appendix C. An analysis must be performed to establish, on the basis of the airplane's operational needs, the adequacy of the ice protection system for the various components of the airplane.

(c) In addition to the analysis and physical evaluation prescribed by paragraph (b) of this section, the effectiveness of the ice protection system and its components must be shown by—

(1) Laboratory dry air or simulated icing tests, or a combination of both, of the components or models of the components;

(2) Flight dry air tests of the ice protection system as a whole, or of its individual components;

(3) Flight tests of the airplane or its components in measured simulated icing conditions; or

(4) Flight tests of the airplane in measured natural atmospheric icing conditions.

(d) The recommended procedures for the use of the ice protection equipment must be recorded in the Airplane Flight Manual.

(e) For turbine engine powered airplanes, the ice protection provisions of this section are considered to be applicable primarily to the airframe. For the powerplant installation, certain additional provisions of Subpart E of this part may be found applicable.

[Revision note: Based on § 4b.640]

§ 25.1055 Flare installation.

(a) Parachute flares must be releasable from the pilot compartment and must be installed in a manner that minimizes the probability of accidental discharge.

(b) It must be shown in a flight test that the flare installation can eject flares without hazard to the airplane and its occupants. If ejection of the flares involves recoil loads, structural provisions for these loads must be made.

[Revision note: Based on § 4b.642]

§ 25.1057 Safety belts.

Safety belts must be approved. The rated strength of the safety belt may not be less than that required to withstand the ultimate load factors specified in § 25.331(a), considering the dimensional characteristics of the safety belt installation for the specific seat or berth arrangement. Safety belts must be attached so that no part of the anchorage will fail at a load lower than that which would result from the application of ultimate load factors equal to those specified in § 25.331(a), multiplied by a factor of 1.33. This factor must be used instead of the fitting factor prescribed in § 25.411. The forward load factor need not be applied to safety belts for berths.

[Revision note: Based on § 4b.643]

§ 25.1059 Safety belt signal.

If the airplane has a means to indicate to the passengers when seat belts should be fastened, the means must be installed so that it can be operated from either pilot's seat.

[Revision note: Based on § 4b.644]

§ 25.1061 Ditching equipment.

(a) Ditching equipment used in airplanes to be certificated for ditching in accordance with § 25.531 and operated in accordance with the rules of this chapter, must meet the following requirements:

(1) Life rafts must be approved. In addition, the buoyancy and seating capacity of the rafts above the rated capacity must be large enough (or there must be enough additional rafts) to accommodate all occupants of the airplane if one liferaft of the largest rated capacity on board is lost. Each liferaft must have a trailing line and a static line. The static line must hold the raft near the airplane and release it if the airplane becomes totally submerged. Each raft must be marked with obvious operating instructions.

(2) Approved survival equipment must be attached to each liferaft and must be marked for identification and for method of operation.

(3) There must be an approved long-range signaling device, for use in one of the liferafts.

(4) Life preservers must be approved. In addition, they must be reversible and must be marked with obvious operating instructions.

(b) If the airplane does not have life preservers that meet the requirements of paragraph (a)(4) of this section, it must have an approved flotation means for each occupant. This flotation means must be within easy reach of each seated occupant and must be readily removable from the airplane.

[Revision note: Combines §§ 4b.645 (less (e)) and 4b.647]

§ 25.1063 Stowage of safety equipment.

(a) All prescribed safety equipment to be used in emergencies must be stowed so that—

(1) It is directly accessible;

(2) Its location is obvious; and

(3) It is protected from inadvertent damage.

(b) The stowage provisions must be conspicuously marked to identify the contents and facilitate removal of the equipment. In addition, the following applies:

(1) The stowage provisions for the emergency exit means required by § 25.543(e) must be at the exits that they are intended to serve.

(2) The stowage provisions for the liferafts described in § 25.1061(a) must accomodate a sufficient number of rafts for the maximum number of occupants for which certification for ditching is requested. Stowage must be near exits through which the rafts can be launched during an unplanned ditching. Rafts automatically or remotely released outside of the airplane must be attached to the airplane by means of the static line prescribed in § 25.1061(a).

(3) The stowage provisions for the long-range signalling device required by § 25.1061(c) must be near an exit that is available during an unplanned ditching.

(4) The stowage provisions for life preservers described in § 25.1061(a)(4) must accommodate one life preserver for each occupant for which certification for ditching is requested. The stowage provisions must be located so that a life preserver is within easy reach of each seated occupant.

(5) For airplanes to be certificated for ditching in accordance with § 25.531, there must be provisions to store life lines. These provisions must allow one life line to be attached to each side of the fuselage and must be arranged to allow the life lines to be used to enable the occupants to stay on the wing after ditching.

[Revision note: Combines §§ 4b.645(e) and 4b.646]

MISCELLANEOUS EQUIPMENT

§ 25.1071 Radio and electronic equipment.

(a) In showing compliance with § 25.949 (a) and (b) with respect to radio and electronic equipment and their installations, critical environmental conditions must be considered.

(b) Radio and electronic equipment must be supplied with power under the provisions of § 25.1005(c).

(c) Radio and electronic equipment, controls, and wiring must be installed so that operation of any one unit or system of units will not adversely affect the simultaneous operation of any other radio or electronic unit or system of units required by this chapter.

[Revision note: Based on § 4b.650]

§ 25.1073 Oxygen equipment and supply.

If the airplane is to be certificated for use with oxygen equipment, the equipment must conform to the requirements of this section and §§ 25.1075 through 25.1087. The installed oxygen system must be free from hazards in itself, in its method of operation, and in its effect upon other components of the airplane. There must be a means to enable the crew to readily determine, during flight, the quantity of oxygen available in each source of supply. The oxygen flow rate and the oxygen equipment for airplanes for which certification for operation above 40,000 feet is requested must be approved.

[Revision note: Based on § 4b.651(a)]

§ 25.1075 Minimum mass flow of supplemental oxygen.

The minimum required mass flow of supplemental oxygen per person, at various cabin pressure altitudes, must meet the following requirements:

(a) If continuous flow equipment is installed for use by flight crewmembers, the minimum mass flow of supplemental oxygen required for each crewmember may not be less than the flow required to maintain, during inspiration, a mean tracheal oxygen partial pressure of 149 mm. Hg. when breathing 15 liters per minute, BTPS, and with a maximum tidal volume of 700 cc. with a constant time interval between respirations.

(b) If demand equipment is installed for use by flight crewmembers, the minimum mass flow of supplemental oxygen required for each crewmember may not be less than the flow required to maintain, during inspiration, a mean tracheal oxygen partial pressure of 122 mm. Hg., up to and including a cabin pressure altitude of 35,000 feet, and 95 percent oxygen between cabin pressure altitudes of 35,000 and 40,000 feet, when breathing 20 liters per minute BTPS. In addition, there must be provisions to allow the crew to use undiluted oxygen at their discretion.

(c) For passengers and cabin attendants, the minimum mass flow of supplemental oxygen required for each person at various cabin pressure altitudes may not be less than the flow required to maintain, during inspiration and while using the oxygen equipment (including masks) provided, the following mean tracheal oxygen partial pressures:

(1) At cabin pressure altitudes above 10,000 feet up to and including 18,500 feet, a mean tracheal oxygen partial pressure of 100 mm. Hg. when breathing 15 liters per minute, BTPS, and with a tidal volume of 700 cc. with a constant time interval between respirations.

(2) At cabin pressure altitudes above 18,500 feet up to and including 40,000 feet, a mean tracheal oxygen partial pressure of 83.8 mm. Hg. when breathing 30 liters per minute, BTPS, and with a tidal volume of 1,100 cc. with a constant time interval between respirations.

(d) If first-aid oxygen equipment is installed, the minimum mass flow of oxygen to each user may not be less than four liters per minute, STPD. However, there may be a means to decrease this flow to not less than two liters per minute, STPD, at any cabin altitude. The quantity of oxygen required is based upon an average flow rate of three liters per minute per person for whom first-aid oxygen is required.

(e) If portable oxygen equipment is installed for use by crewmembers, the minimum mass flow of supplemental oxygen is the same as specified in paragraph (a) or (b) of this section, whichever is applicable.

[Revision note: Based on § 4b.651(b)]

§ 25.1077 Equipment standards for the oxygen distributing system.

(a) When oxygen is supplied to both crew and passengers, the distribution system must be designed for either—

(1) A source of supply for the flight crew on duty and a separate source for the passengers and other crewmembers; or

(2) A common source of supply with means to separately reserve the minimum supply required by the flight crew on duty.

(b) Portable walk-around oxygen units of the continuous flow, diluter-demand, and straight demand types may be used to satisfy any of the crew or passenger breathing requirements.

[Revision note: Combines §§ 4b.651(c) and 4b.651-5(a)]

§ 25.1079 Equipment standards for oxygen dispensing units.

If oxygen dispensing units are installed, they must conform to the provisions of paragraphs (a), (b), and (c) of this section.

(a) There must be an individual dispensing unit for each occupant for whom supplemental oxygen is to be supplied. Units must be designed to cover the nose and mouth and must be equipped with a suitable means to retain the unit in position on the face. Flight crew masks for supplemental oxygen must have provisions for the use of communication equipment.

(b) Airplanes for which certification for operation up to and including 25,000 feet is requested must have available to, and within reach of, each flight crewmember an oxygen supply terminal and unit of oxygen dispensing equipment for the immediate use of oxygen by the crewmember. For all other occupants, the supply terminals and dispensing equipment must be located to allow the use of oxygen as required by the regulations in this chapter.

(c) Airplanes for which certification for operation above 25,000 feet is requested must have oxygen dispensing equipment meeting the following requirements:

(1) There must be an oxygen dispensing unit connected to oxygen supply terminals immediately available to each occupant, wherever seated. In addition, in airplanes for which certification for operation above 30,000 feet is requested, the dispensing units providing the required oxygen flow rate must be automatically presented to the occupants. The total number of dispensing units and outlets must exceed the number of seats by at least 10 percent. The extra units must be as uniformly distributed throughout the cabin as practicable.

(2) Crewmembers on flight deck duty must be provided with demand equipment. In addition, there must be an oxygen dispensing unit, connected to an oxygen supply terminal, immediately available to each flight crewmember when seated at his station.

(3) There must be at least two outlets and units of dispensing equipment of a type similar to that required by subparagraph (1) of this paragraph in—

(i) Each washroom; and

(ii) Each lavatory, if separate from the washroom.

(4) Portable oxygen equipment must be immediately available for each cabin attendant.

[Revision note: Based on § 4b.651(d)]

§ 25.1081 Means for determining use of oxygen.

The airplane must have a means to enable the crew to determine if oxygen is being delivered to the dispensing equipment.

[Revision note: Based on § 4b.651(e)]

§ 25.1083 Fire protection for oxygen equipment.

(a) Oxygen equipment and lines may not be in any designated fire zone.

(b) Oxygen equipment and lines must be protected from heat that may be generated in, or escape from, any designated fire zone.

(c) Oxygen equipment and lines must be installed so that escaping oxygen cannot cause ignition of grease, fluids, or vapor accumulations that are likely to be present in normal operation or as a result of failure or malfunctioning of any system.

[Revision note: Based on § 4b.651(f)]

§ 25.1085 Protection of oxygen equipment from rupture.

Oxygen pressure tanks, and lines between tanks and the shutoff means, must be protected from the effects of unsafe temperatures. In addition, they must be located where the probability and hazards of rupture in a crash landing are minimized.

[Revision note: Based on § 4b.651(g)]

§ 25.1087 Protective breathing equipment.

(a) If protective breathing equipment is installed, it must be designed to protect the flight crew from the effects of smoke, carbon dioxide, and other harmful gases while on flight deck duty and while combating fires in cargo compartments. In addition, the protective breathing equipment and the necessary supply of oxygen must be designed to meet the following requirements:

(1) The protective breathing equipment includes masks covering the eyes, nose, and mouth, or only the nose and mouth if there is accessory equipment to protect the eyes. The equipment, while in use, must allow the flight crew to use the radio equipment and to communicate with each other, while at their assigned duty stations. The part of the equipment protecting the eyes may not cause any appreciable adverse effect on vision and must allow corrective glasses to be worn.

(2) There must be a supply of protective oxygen of 15-minute duration, at a pressure altitude of 8,000 feet and a respiratory minute volume of 30 liters per minute BTPD, for each crewmember. If a demand type oxygen system is used, a supply of 300 liters of free oxygen at 70° F. and 760 mm. Hg. pressure is considered to be of 15-minute duration at the prescribed altitude and minute volume. If a continuous flow protective breathing system is used (including a mask with a standard rebreather bag) a flow rate of 60 liters per minute at 8,000 feet (45 liters per minute at sea level) and a supply of 600 liters of free oxygen at 70° F. and 760 mm. Hg. pressure is considered to be of 15-minute duration at prescribed altitude and minute volume. BTPD refers to body temperature conditions (that is, 37° C., at ambient pressure, dry).

(b) Portable protective breathing units of the demand or continuous flow type may be used instead of a fixed protective breathing system.

[Revision note: Combines §§ 4b.651(h) and 4b.651-2(c)]

§ 25.1089 Hydraulic systems; strength.

(a) All elements of the hydraulic system must be designed to withstand, without detrimental permanent deformation; all structural loads that may be imposed simultaneously with the maximum hydraulic loads occurring in operation.

(b) All elements of the hydraulic system must be tested to a proof pressure of 1.5 times the maximum pressure that the part will be subjected to in normal operation. No part of the hydraulic system may fail, malfunction, or suffer detrimental deformation, during this test.

(c) Individual hydraulic system elements must be designed to withstand pressures, that are sufficiently above the pressures prescribed in paragraph (b) of this section, to safeguard against rupture under service conditions.

[Revision note: Based on § 4b.653]

§ 25.1091 Hydraulic systems; design.

(a) The airplane must have a means to indicate the pressure in each main hydraulic power system. In addition, the airplane must have means to ensure that pressures in any part of the system will not exceed a safe limit above the maximum operating pressure of the system and to prevent excessive pressures resulting from fluid volumetric changes in all lines that are likely to remain closed long enough for this kind of change to occur. In addition, the possible occurrence of detrimental transient (surge) pressures during operation must be considered.

(b) Hydraulic lines, fittings, and components must be installed, and supported, to prevent excessive vibration and to withstand inertia loads. Elements of the installation must be protected from abrasion, corrosion, and mechanical damage.

(c) Flexible hose, or other means of providing flexibility, must be used to connect points in a hydraulic fluid line between which there is relative motion or differential vibration.

[Revision note: Based on § 4b.654]

§ 25.1093 Hydraulic system fire protection.

If a flammable type hydraulic fluid is used, the hydraulic system must conform to the provisions of §§ 25.591, 25.873, 25.875, and 25.877.

[Revision note: Based on § 4b.655]

§ 25.1095 Vacuum systems.

(a) In addition to the normal pressure relief, the airplane must have a means to automatically relieve the pressure in the discharge lines from the vacuum pump, if the delivery temperature of the air reaches an unsafe value.

(b) Vacuum system lines, and fittings, on the discharge side of the pump that might contain flammable vapors or fluids, must meet the provisions of § 25.877 if they are in a designated fire zone. Other vacuum system components in designated fire zones must be fire-resistant.

[Revision note: Based on § 4b.658]

§ 25.1097 Draining of fluids subject to freezing.

If fluids subject to freezing may be drained overboard either in flight or during ground operation, the drains must be designed and located to prevent the formation of ice on the airplane as a result of the drainage.

[Revision note: Based on § 4b.660]

Subpart G—Operating Limitaitons and Information

§ 25.1141 General.

(a) The operating limitations listed in §§ 25.1151 through 25.1177 must be established as prescribed in this part.

(b) The operating limitations and any other information that is necessary for safe operation of the airplane must be—

(1) Recorded in the Airplane Flight Manual;

(2) Expressed as markings and placards; and

(3) Made available by any other means that will convey the information to the crewmembers.

[Revision note: Based on § 4b.700]

OPERATING LIMITATIONS

§ 25.1151 Airspeed limitations; general.

If airspeed limitations are a function of weight, weight distribution, altitude, or Mach number, the values corresponding to all critical combinations of these values must be established.

[Revision note: Based on § 4b.710]

§ 25.1153 Maximum operating limit speed.

(a) The maximum operating limit speed (V_{MO}/M_{MO}—airspeed or Mach number, whichever is critical at a particular altitude) is a speed that may not be deliberately exceeded in any regime of flight (climb, cruise, or descent), unless a higher speed is authorized for flight test or pilot training operations. V_{MO}/M_{MO} must be established so that it is not greater than the design cruising speed V_C and so that it is sufficiently below V_D/M_D or V_{DF}/M_{DF} to make it highly improbable that the latter speeds will be inadvertently exceeded in operations. The speed margin between V_{MO}/M_{MO} and V_D/M_D or V_{DF}/M_{DF} must be determined in accordance with paragraph (b) of this section but may not be—

(1) Less than the margin found necessary in the flight tests conducted in accordance with § 25.173 (formerly § 4b.-191); and

(2) Greater than $V_{MO}/M_{MO}=0.8\ V_D/M_D$, or greater than $V_{MO}/M_{MO}=0.8\ V_{DF}/M_{DF}$.

(b) The minimum speed margin is the greater of the values determined in accordance with subparagraphs (1) and (2) of this paragraph:

(1) From an initial condition of stabilized flight at V_{MO}/M_{MO}, the airplane is assumed to be upset, flown for 20 seconds along a flight path 7.5 degrees below the initial path, and then pulled up at a load factor of 1.5 (.5g acceleration increment). The speed increase occurring in this maneuver may be calculated if reliable or conservative aerodynamic data are used. Power, as specified in § 25.131(a), is assumed until the pullup is initiated, at which time power reduction and the use of pilot controlled drag devices may be assumed.

(2) The minimum speed margin must be enough to provide for atmospheric variations (such as horizontal gusts, penetration of jet stream or cold front) and for instrument errors and airframe production variations. These factors may be considered on a probability basis. However, the margin at altitudes where M_{MO} is limited by compressibility effects may not be less than 0.05M.

[Revision note: Based on § 4b.711]

§ 25.1155 Maneuvering speed.

The established maneuvering speed may not exceed the design maneuvering speed V_A determined in accordance with § 25.203(b).

[Revision note: Based on § 4b.713]

§ 25.1157 Flap extended speed.

The established flap extended speeds V_{FE} may not exceed the design flap speeds V_F chosen in accordance with

§§ 25.203(a) and 25.213, for the corresponding flap positions and engine powers.

[Revision note: Based on § 4b.714]

§ 25.1159 Landing gear operating speed.

The established landing gear operating speed V_{LO} may not exceed the speed at which it is safe to extend or retract the landing gear, as limited by design (in accordance with § 25.471) or by flight characteristics.

[Revision note: Based on § 4b.715]

§ 25.1161 Landing gear extended speed.

The established landing gear extended speed, V_{LE}, may not exceed the speed at which it has been shown that the airplane can be safely flown with the landing gear secured in the fully extended position, and for which the structure has been proven in accordance with § 25.471.

[Revision note: Based on § 4b.716]

§ 25.1163 Minimum control speed.

The minimum control speed V_{MC} is determined in accordance with § 25.107.

[Revision note: Based on § 4b.717]

§ 25.1165 Powerplant limitations.

(a) The following powerplant limitations must be established:

(1) For takeoff operation—

(i) The maximum rotational speed (rpm);

(ii) The maximum allowable manifold pressure (for reciprocating engines);

(iii) The maximum allowable gas temperature (for turbine engines);

(iv) The time limit for the use of the power or thrust that corresponds to the values established in subdivisions (i) through (iii) of this subparagraph;

(v) The maximum allowable cylinder head (as applicable) and oil temperatures if the time limit established in subdivision (iv) of this paragraph exceeds two minutes; and

(vi) The maximum cylinder head (as applicable) and oil temperatures if the maximum cylinder head and oil temperatures differ from the maximum limits for continuous operation.

(2) For maximum continuous operation—

(i) Maximum rotational speed (rpm);

(ii) The maximum allowable manifold pressure; and

(iii) The maximum allowable cylinder head, oil, and gas temperatures.

(3) For fuel grade or designation, the minimum fuel grade for reciprocating engines or the fuel designation for turbine engines, required for the operation of the engine within the limitations prescribed in subparagraphs (1) and (2) of this paragraph.

(4) For ambient temperature limitations, the maximum ambient atmospheric temperature at which compliance with the cooling provisions of §§ 25.781 through 25.787 is established.

(b) No powerplant limitation established under this section may exceed any corresponding limit established as a part of the type certification of the engine or propeller used.

[Revision note: Based on § 4b.718]

§ 25.1167 Airplane weight, center of gravity, and weight distribution limitations.

The airplane weight, center of gravity, and weight distribution, limitations are those prescribed in §§ 25.13 through 25.17. If certification for more than one center of gravity range is requested, the appropriate limitations, with regard to weight and loading procedures, for each separate center of gravity range, must be recorded in the Airplane Flight Manual.

[Revision note: Based on § 4b.719]

§ 25.1169 Minimum flight crew.

The minimum flight crew is established by the Administrator as that number of persons that he finds necessary for safety in the operations authorized under § 25.1171. This finding is based upon the work load imposed upon individual crewmembers, considering the accessibility and the ease of operation of all necessary controls by the appropriate crewmembers.

[Revision note: Based on § 4b.720]

§ 25.1171 Kinds of operation.

The kinds of operation to which the airplane is limited are established in accordance with the equipment installed and with the terms and conditions recorded in type certificate.

[Revision note: Based on § 4b.721]

§ 25.1173 Maximum operating altitude.

The maximum altitude up to which operation is allowed, as limited by flight, structural, powerplant, functional, or equipment characteristics, must be established.

[Revision note: Based on § 4b.722]

§ 25.1175 Maneuvering flight load factors.

Load factor limitations, not exceeding the positive limit load factors determined from the maneuvering diagram in § 25.207(b), must be established.

[Revision note: Based on § 4b.723]

§ 25.1177 Additional operating limitations for turbine engine powered airplanes.

(a) The operation limitations for turbine engine powered airplanes are as follows:

(1) The maximum takeoff weights are the weights at which compliance is shown with the applicable provisions of this Part (including the takeoff climb provisions of § 25.87 (a), (b), and (c), for altitudes and ambient temperatures).

(2) The maximum landing weights are the weights at which compliance is shown with the applicable provisions of this Part (including the landing and takeoff climb provisions of §§ 25.85 and 25.87 for altitudes and ambient temperatures).

(3) The minimum takeoff distances are the distances at which compliance is shown with the applicable provisions of this Part (including, if the takeoff distance includes a clearway, the accelerate-stop distance provisions of § 25.75, and the takeoff distance and takeoff run provisions of § 25.79, for weights, altitudes, temperatures, wind components, and runway gradients).

(b) The applicant must select, for turbine engine powered airplanes, the operation limitations for all variable factors used to comply with this Part.

[Revision note: Based on § 4T.123(a)]

MARKINGS AND PLACARDS

§ 25.1191 Markings and placards; general.

Markings and placards must be displayed in conspicuous places. They must be constructed so that they are not easily erased, disfigured, or obscured. Additional information, placards, and instruments markings, with a direct and important bearing on safe operation may be required by the Administrator because of unusual design, operating, or handling characteristics.

[Revision note: Based on § 4b.730]

§ 25.1193 Instrument markings; general.

(a) If markings are on the cover glass of the instrument, there must be provisions to maintain the correct alignment of the glass cover with the face of the dial.

(b) Arcs and lines must be of sufficient width and must be clearly visible to the pilot.

[Revision note: Based on § 4b.731]

§ 25.1195 Airspeed limitation information.

The airspeed limitations required by § 25.1223(a) must be shown so that they can be easily read and understood by the flight crew.

[Revision note: Based on § 4b.732]

§ 25.1197 Magnetic direction indicator.

A placard that contains the calibration of the instrument in a level flight attitude with the engines operating and the radio receiver(s) on or off (state which), must be installed on or near the magnetic direction indicator. The calibration readings must be in terms of magnetic headings in not greater than 45° increments.

[Revision note: Based on § 4b.733]

§ 25.1199 Powerplant instruments; general.

Required powerplant instruments must be marked as follows:

(a) The maximum and the minimum (if applicable) safe operational limits must be marked with red radial lines.

(b) The normal operating ranges must be marked with a green arc not extending beyond the maximum and minimum safe operational limits.

(c) The takeoff and precautionary ranges must be marked with a yellow arc.

(d) Engine or propeller speed ranges that are restricted because of excessive vibration stresses must be marked with red arcs.

[Revision note: Based on § 4b.734]

§ 25.1201 Oil quantity indicators.

Oil quantity indicators must be marked with sufficient increments to readily and accurately indicate the quantity of oil.

[Revision note: Based on § 4b.735]

§ 25.1203 Fuel quantity indicator.

If the unusable fuel supply for any tank exceeds 1 gallon or 5 percent of the tank capacity, whichever is greater, a red arc, extending from the calibrated zero reading to the lowest reading obtainable in the level flight attitude, must be marked on the indicator. A notation in the Airplane Flight Manual, to indicate that the fuel remaining in the tank when the quantity indicator reaches zero is not usable in flight, must be made.

[Revision note: Based on § 4b.736]

§ 25.1205 Control markings.

With the exception of primary flight controls and other controls whose function is obvious, all controls must be plainly marked or identified as to their function and method of operation. In addition, the following requirements apply:

(a) Aerodynamic controls must be marked in accordance with the requirements of §§25.435 and 25.437.

(b) Powerplant fuel controls must be marked so that—

(1) Controls for fuel tank selector valves indicate the position corresponding to each tank and to all possible crossfeed positions;

(2) Controls for engine selector valves indicate the position corresponding to each engine; and

(3) The fuel tank selector controls are marked adjacent to or on the control itself to indicate the order in which the tanks should be used, if there is more than one fuel tank and if safe operation depends upon the use of tanks in a specific sequence.

(c) Accessory and auxiliary controls must be marked so that—

(1) Emergency controls, including fuel jettisoning and fluid shutoff controls, are colored red; and

(2) For the visual indicator required by § 25.471(e), the pilot can ascertain at all times when the wheels are locked in either extreme position, if a retractable landing gear is used.

[Revision note: Based on § 4b.737]

§ 25.1207 Baggage compartment and ballast location placards.

Each baggage and cargo compartment, as well as the ballast location, must bear a placard stating the maximum allowable weight of contents and, if applicable, any other limitation on contents found necessary due to loading requirements.

[Revision note: Based on § 4b.738(a)]

§ 25.1209 Fuel and oil filler opening markings.

Fuel and oil filler openings must be marked on, or adjacent to, the appropriate filler cover with—

(a) For fuel tanks, the word "Fuel", the minimum allowable fuel grade or designation for the engines installed, and the usable fuel tank capacity; and

(b) For oil tanks, the word "Oil", and the oil tank capacity.

[Revision note: Based on § 4b.738(b)]

§ 25.1211 Emergency exit placards.

Emergency exit placards must conform to the requirements of § 25.545.

[Revision note: Based on § 4b.738(c)]

§ 25.1213 Safety equipment.

(a) Safety equipment controls that the crew is expected to operate in time of emergency (such as controls for flares, automatic life raft releases, and similar items) must be readily accessible and plainly marked as to their method of operation.

(b) If fire extinguishers and signaling and other lifesaving equipment are carried in lockers, compartments, or similar locations, these locations must be marked as to the contents.

[Revision note: Based on § 4b.738(d)]

§ 25.1215 Airspeed placard.

A placard giving the maximum airspeeds for flap extension to the takeoff, approach, and landing positions must be installed in clear view of each pilot.

[Revision note: Based on § 4b.738 (less (a) through (d))]

AIRPLANE FLIGHT MANUAL

§ 25.1221 General.

(a) An Airplane Flight Manual must be prepared by the applicant, and must be furnished with each airplane, unless otherwise prescribed in this chapter.

(b) The parts of the manual listed in §§ 25.1223 through 25.1229, as appropriate, must be approved and must be segregated, identified, and clearly distinguished from parts that are not approved.

(c) Additional items of information with a direct and important bearing on safe operation may be required if the airplane has unusual design, operating, or handling characteristics.

[Revision note: Based on § 4b.740]

§ 25.1223 Operating limitations.

The operating limitations and other information listed in this section must be recorded in the Airplane Flight Manual:

(a) The following airspeed limitations and other information sufficient to meet the presentation requirements of § 25.1195:

(1) The maximum operating limit speed V_{MO}/M_{MO} and a statement that this speed limit may not be deliberately exceeded in any regime of flight (climb, cruise, or descent) except if a higher speed is authorized for flight test or pilot training operations.

(2) If an airspeed limitation is based upon compressibility effects, a statement to this effect and information as to any symptoms, the probable behavior of the airplane, and the recommended recovery procedures.

(3) The maneuvering speed V_A and a statement to the effect that full application of rudder and aileron controls, as well as those maneuvers that involve angles of attack near the stall, should be confined to speeds below this value.

(4) The flap extended speed V_{FE} and a description of the pertinent flap positions and engine powers.

(5) The landing gear operating speed V_{LO} and a statement to the effect that this is the maximum speed at which it is safe to extend or retract the landing gear.

(6) The landing gear extended speed V_{LE}, if greater than the landing gear operating speed, and a statement to the effect that this is the maximum speed at which the airplane can be safely flown with the landing gear in the extended position.

(b) Information to outline and explain all powerplant limitations and information on the instrument marking requirements of §§ 25.1199 through 25.1203.

(c) The airplane weights and center of gravity limits required by §§ 25.13 and 25.15, and a list of the items of equipment included in the empty weight of the airplane. In addition, there must be loading instructions, for all loading conditions within these limits, that affect weight and center of gravity.

(d) The positive maneuvering limit load factors for which the airplane structure is proven, described in terms of accelerations, and a statement to the effect that these accelerations limit the angle of bank in turns and limit the severity of pull-up maneuvers.

(e) The number, and a description of the functions, of the minimum flight crew, determined in accordance with § 25.1169.

(f) The kinds of operation for which the airplane is approved in accordance with § 25.1171.

(g) The altitude established in accordance with § 25.1173 and an explanation of the limiting factors.

(h) For turbine engine powered airplanes, the operation limitations established in accordance with § 25.1177.

[Revision note: Combines §§ 4b.741 and 4T.743(a)]

§ 25.1225 Operating procedures.

The operating procedures, and other information, listed in this section must be recorded in the Airplane Flight Manual:

(a) Information and instructions regarding the peculiarities of normal operations (including starting and warming the engines, taxiing, operation of wing flaps, landing gear, and the automatic pilot).

(b) The recommended procedure to be followed if an engine fails (including minimum speeds, trim, operation of the remaining engines, and operation of flaps).

(c) The recommended procedure to be followed when stopping the rotation of propellers in flight.

(d) The recommended procedures, including the effects of altitude, to be followed in restarting turbine engines in flight.

(e) The recommended emergency procedures to be followed in the event of fire, decompression, ditching, and similar emergencies.

[Revision note: Based on § 4b.742]

§ 25.1227 Performance information for reciprocating engine powered airplanes.

The performance information and other information listed in this section, must be recorded in the Airplane Flight Manual:

(a) A summary of all pertinent performance data (including the performance data necessary for the application of the operating rules of this chapter) and descriptions of all conditions (such as airspeed) under which these data were determined.

(b) Instructions describing the use and adjustment of the flap controls necessary to obtain the performance referred to in paragraph (a) of this section.

(c) The indicated airspeeds, corresponding to those determined for takeoff, and the procedures to be followed if a critical engine becomes inoperative during takeoff.

(d) An explanation of any significant or unusual flight or ground handling characteristics.

[Revision note: Based on § 4b.743]

§ 25.1229 Performance information for turbine engine powered airplanes.

The performance information and other information listed in this section must be recorded in the Airplane Flight Manual.

(a) Airplane performance information computed in compliance with the applicable provisions of this part (including §§ 25.81, 25.89, and 25.91 for the weights, altitudes, temperatures, wind components, and runway gradients, as applicable) within the operational limits of the airplane. The descriptions of the conditions under which the performance information was obtained must be included. In addition, the following performance information must be determined by extrapolation and computed for the range of weights between the maximum landing and maximum takeoff weights:

(1) Climb in the landing configuration.

(2) Climb in the approach configuration.

(3) Landing distance.

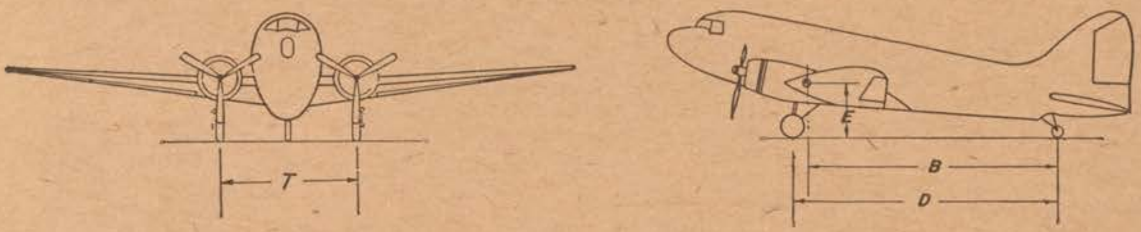
(b) The procedures established in accordance with § 25.65(c) must be included to the extent that these procedures are related to the limitations and information required by § 25.1177 and by paragraph (a) of this section. These procedures must be set forth in the form of guidance material, including any relevant limitations or information.

(c) An explanation of significant or unusual flight or ground handling characteristics of the airplane.

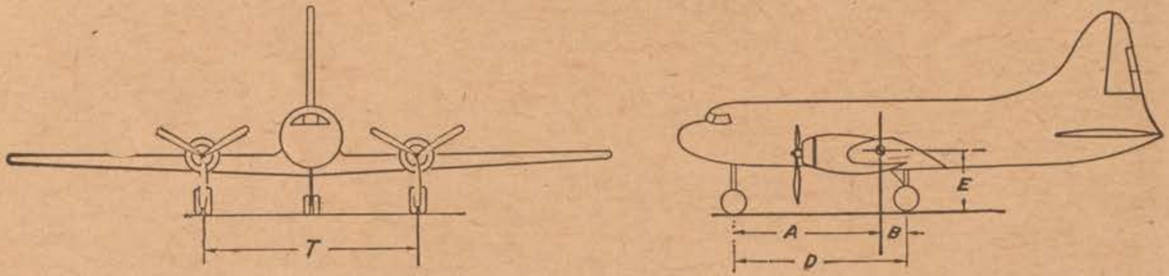
[Revision note: Combines last sentence of §§ 4T.110(a), 4T.123(b), and 4T.743 (less paragraph (a))]

Appendix A

FIGURE 1—Basic landing gear dimension data.

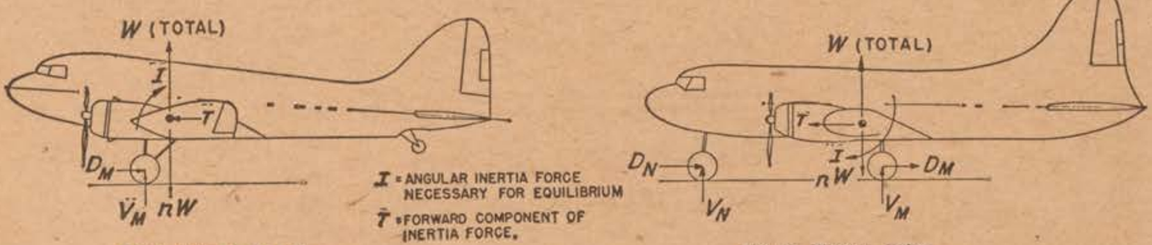


TAIL WHEEL TYPE



NOSE WHEEL TYPE

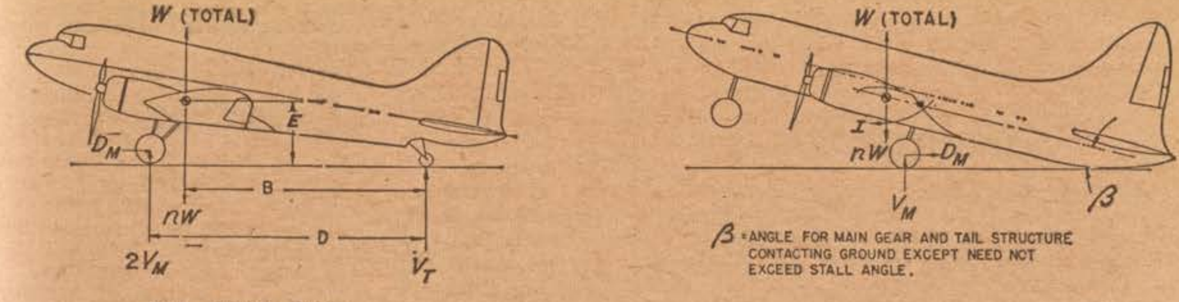
FIGURE 2—Level landing.


W (TOTAL)
I
T̄
D_M
V_M
nW
I = ANGULAR INERTIA FORCE NECESSARY FOR EQUILIBRIUM
T̄ = FORWARD COMPONENT OF INERTIA FORCE.
W (TOTAL)
T
D_N
I
nW
D_M
V_N
V_M

TAIL WHEEL TYPE

NOSE WHEEL TYPE

FIGURE 3—Tail-down landing.

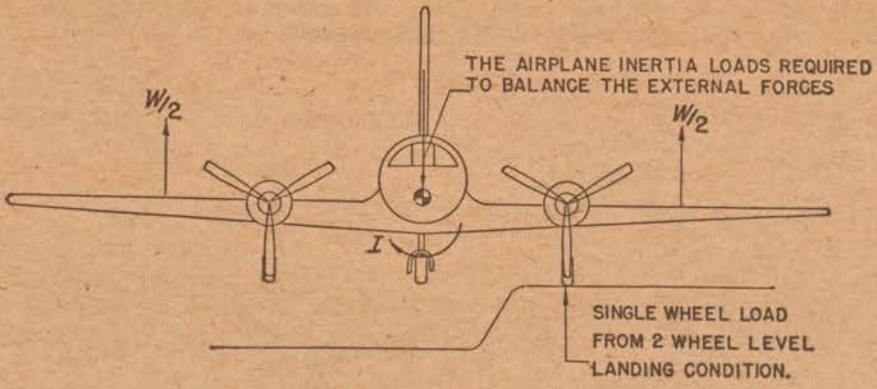


β = ANGLE FOR MAIN GEAR AND TAIL STRUCTURE CONTACTING GROUND EXCEPT NEED NOT EXCEED STALL ANGLE.

TAIL WHEEL TYPE

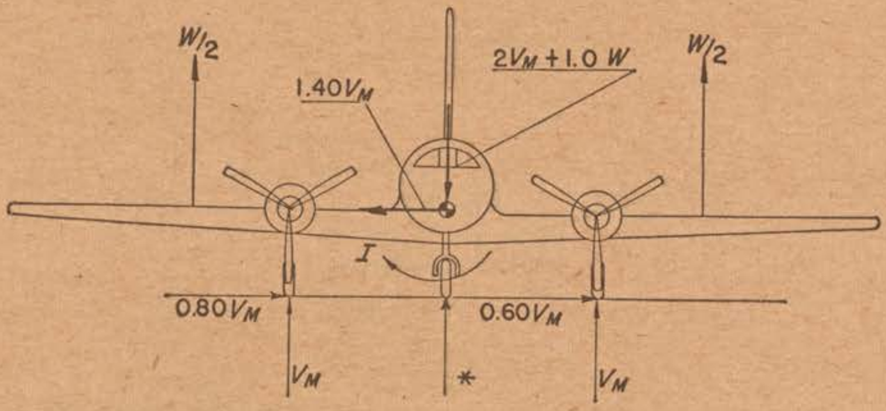
NOSE WHEEL TYPE

FIGURE 4—One-wheel landing.


THE AIRPLANE INERTIA LOADS REQUIRED TO BALANCE THE EXTERNAL FORCES
W/2
W/2
I
SINGLE WHEEL LOAD FROM 2 WHEEL LEVEL LANDING CONDITION.

NOSE OR TAIL WHEEL TYPE

FIGURE 5—Lateral drift landing.



V_M = ONE-HALF THE MAXIMUM VERTICAL GROUND REACTION OBTAINED AT EACH MAIN GEAR IN THE LEVEL LANDING CONDITIONS.

* NOSE GEAR GROUND REACTION = 0

NOSE OR TAIL WHEEL TYPE AIRPLANE IN LEVEL ALTITUDE

FIGURE 6—Braked roll.

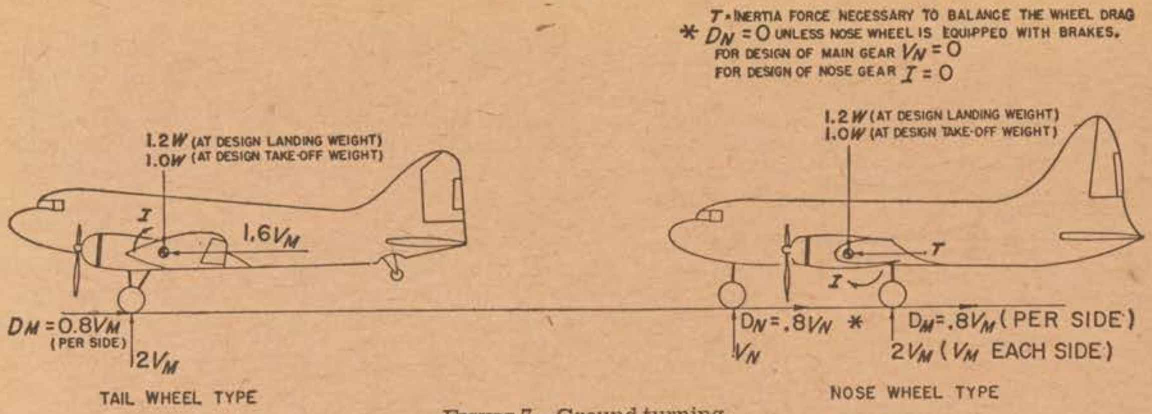

T = INERTIA FORCE NECESSARY TO BALANCE THE WHEEL DRAG
* D_N = 0 UNLESS NOSE WHEEL IS EQUIPPED WITH BRAKES.
FOR DESIGN OF MAIN GEAR V_N = 0
FOR DESIGN OF NOSE GEAR I = 0
1.2 W (AT DESIGN LANDING WEIGHT)
1.0 W (AT DESIGN TAKE-OFF WEIGHT)
I
$1.6V_M$
$D_M = 0.8V_M$ (PER SIDE)
$2V_M$
TAIL WHEEL TYPE
1.2 W (AT DESIGN LANDING WEIGHT)
1.0 W (AT DESIGN TAKE-OFF WEIGHT)
T
I
$D_N = .8V_N$ *
V_N
$D_M = .8V_M$ (PER SIDE)
$2V_M$ (V_M EACH SIDE)
NOSE WHEEL TYPE

FIGURE 7—Ground turning.

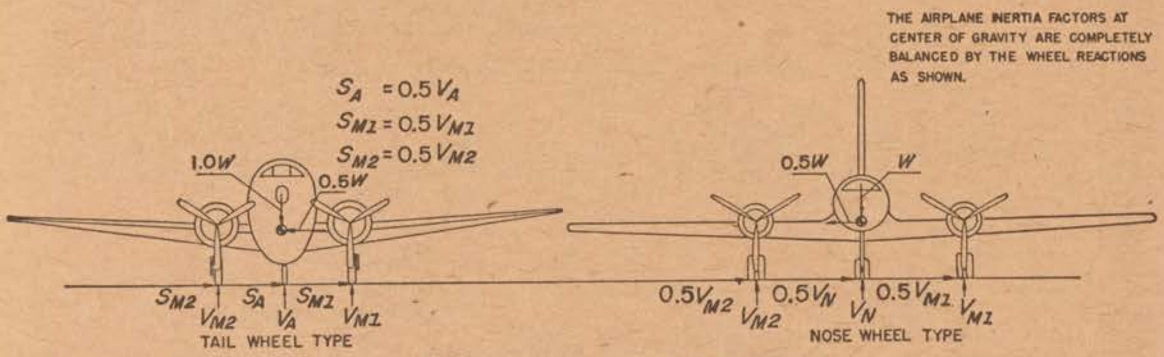
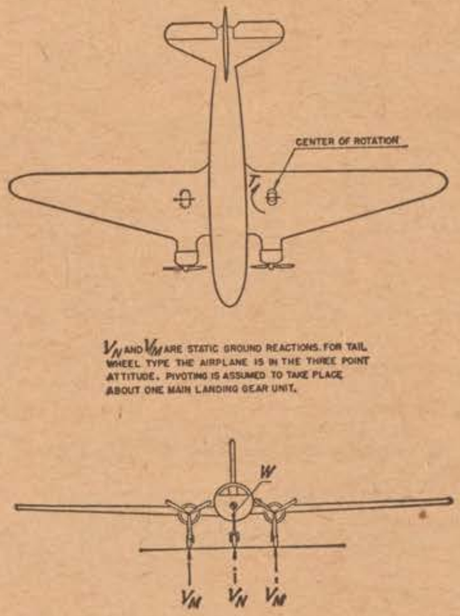


FIGURE 8—Pivoting, nose or tail wheel type.



V_N AND V_M ARE STATIC GROUND REACTIONS. FOR TAIL WHEEL TYPE THE AIRPLANE IS IN THE THREE POINT ATTITUDE. PIVOTING IS ASSUMED TO TAKE PLACE ABOUT ONE MAIN LANDING GEAR UNIT.

Appendix B

FIGURE 1—Pictorial definition of angles, dimensions, and directions on a seaplane.

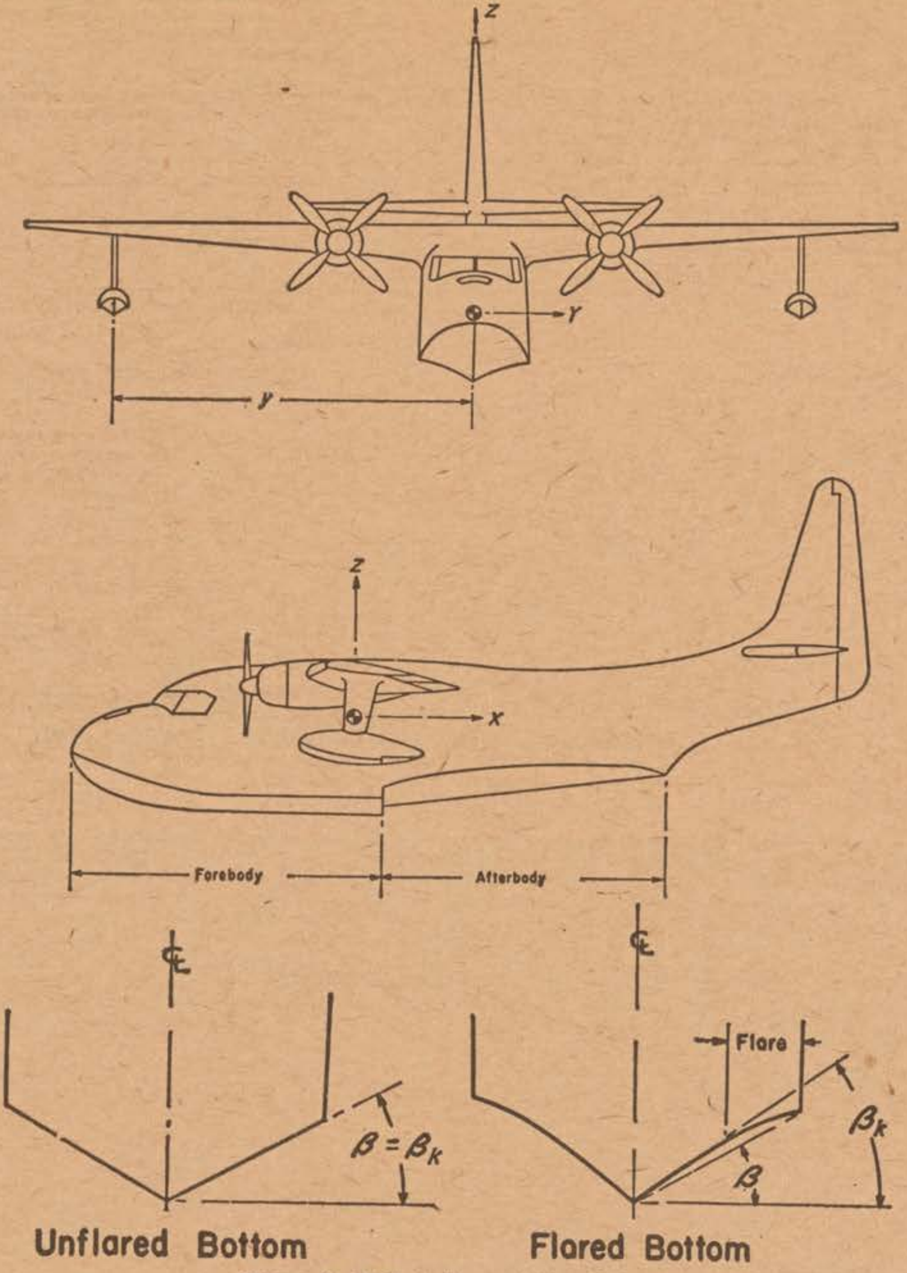


FIGURE 2—Hull station weighing factor.

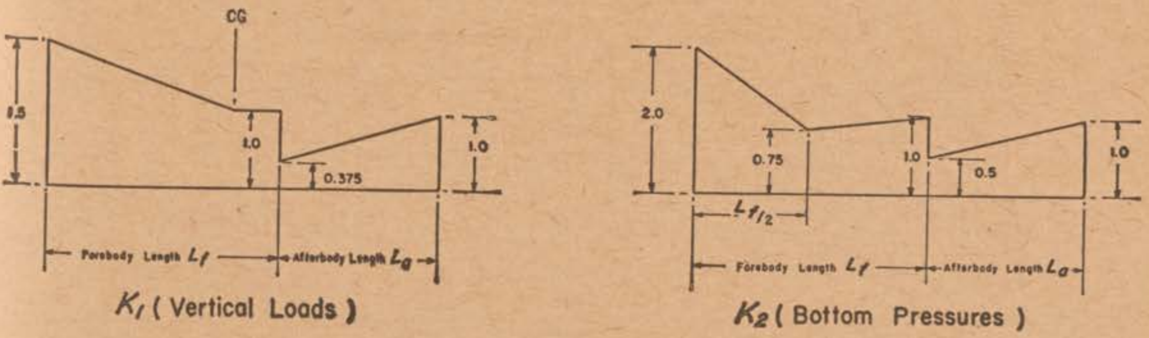
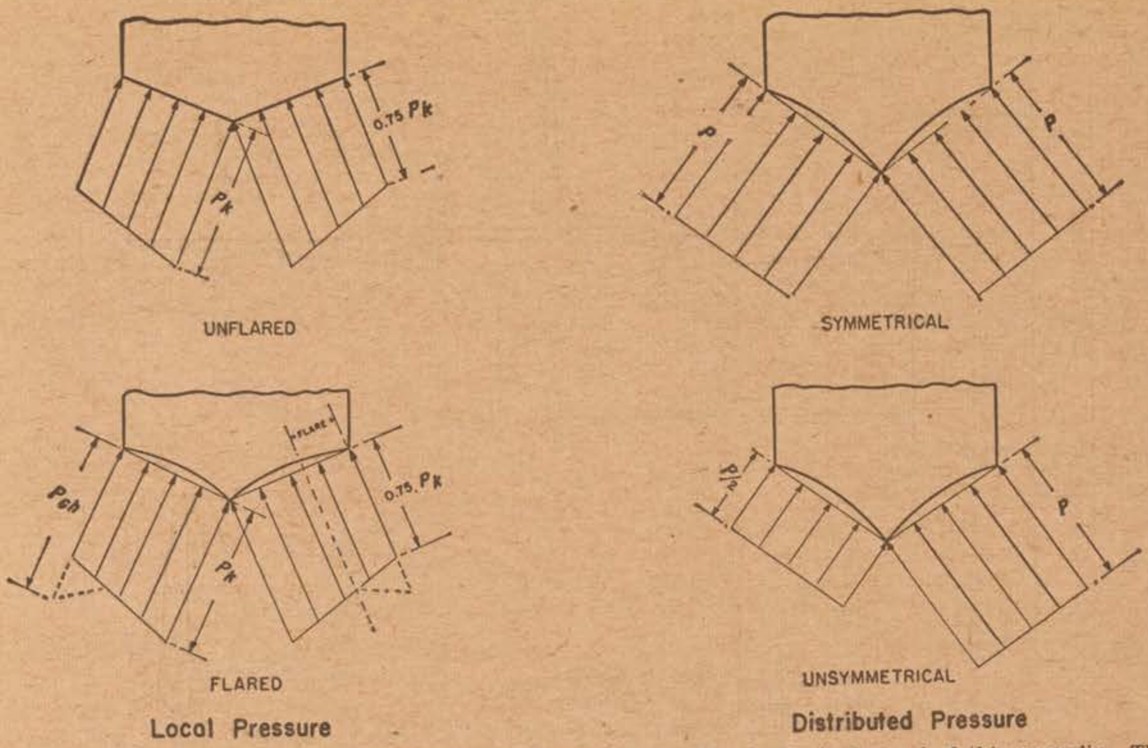


FIGURE 3—Transverse pressure distributions.



Appendix C

(a) *Continuous maximum icing.* The maximum continuous intensity of atmospheric icing conditions (continuous maximum icing) is defined by the variables of the cloud liquid water content, the mean effective diameter of the cloud droplets, the ambient air temperature, and the interrelationship of these three variables as shown in figure 1 of this appendix. The limiting icing envelope in terms of altitude and temperature is given in figure 2 of this appendix. The inter-relationship of cloud liquid water content with drop diameter and altitude is determined from figures 1 and 2. The cloud liquid water content for continuous maximum icing conditions of a horizontal extent, other than twenty miles, is determined by the value of liquid water content of figure 1, multiplied by the appropriate factor from figure 3 of this appendix.

(b) *Intermittent maximum icing.* The intermittent maximum intensity of atmospheric icing conditions (intermittent maximum icing) is defined by the variables of the cloud liquid water content, the mean effective diameter of the cloud droplets, the ambient air temperature, and the interrelationship of these three variables as shown in figure 4 of this appendix. The limiting icing envelope in terms of altitude and temperature is given in figure 5 of this appendix. The inter-relationship of cloud liquid water content with drop diameter and altitude is determined from figures 4 and 5. The cloud liquid water content for intermittent maximum icing conditions of a horizontal extent, other than three miles, is determined by the value of cloud liquid water content of figure 4 multiplied by the appropriate factor in figure 6 of this appendix.

[Revision note: Combines §§ 4b.1(b) (7) and (8) and figures 4b.24(a), 4b.24(b), 4b.24(c), 4b.25(a), 4b.25(b), and 4b.25(c)]

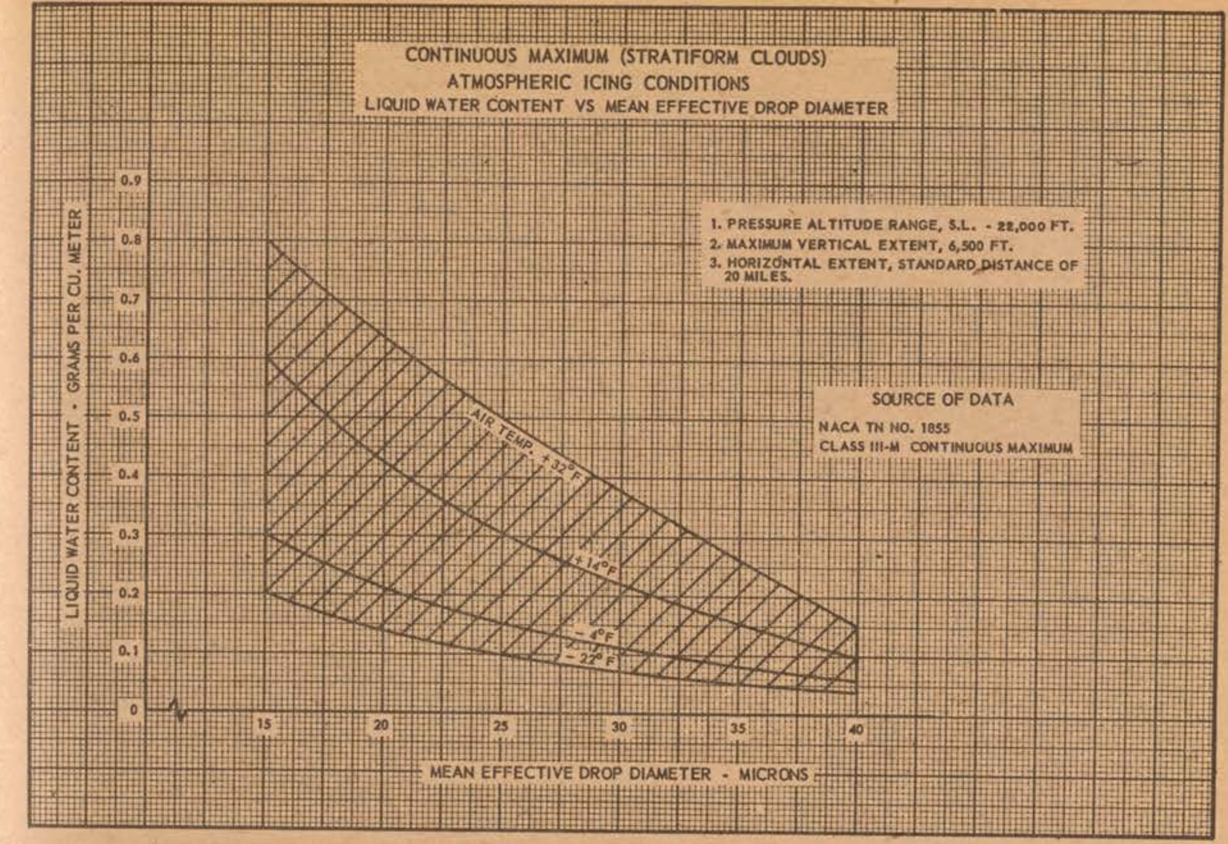


FIGURE 1.

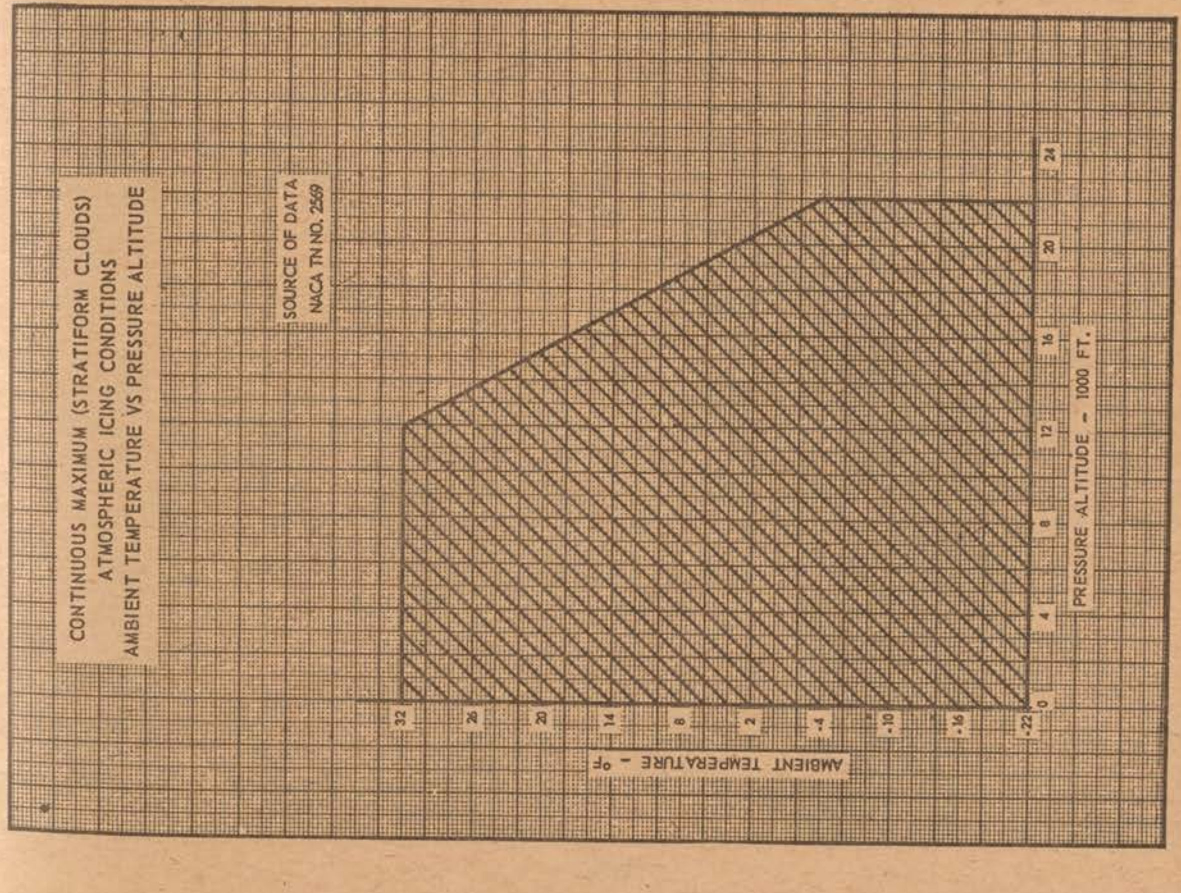


FIGURE 2.

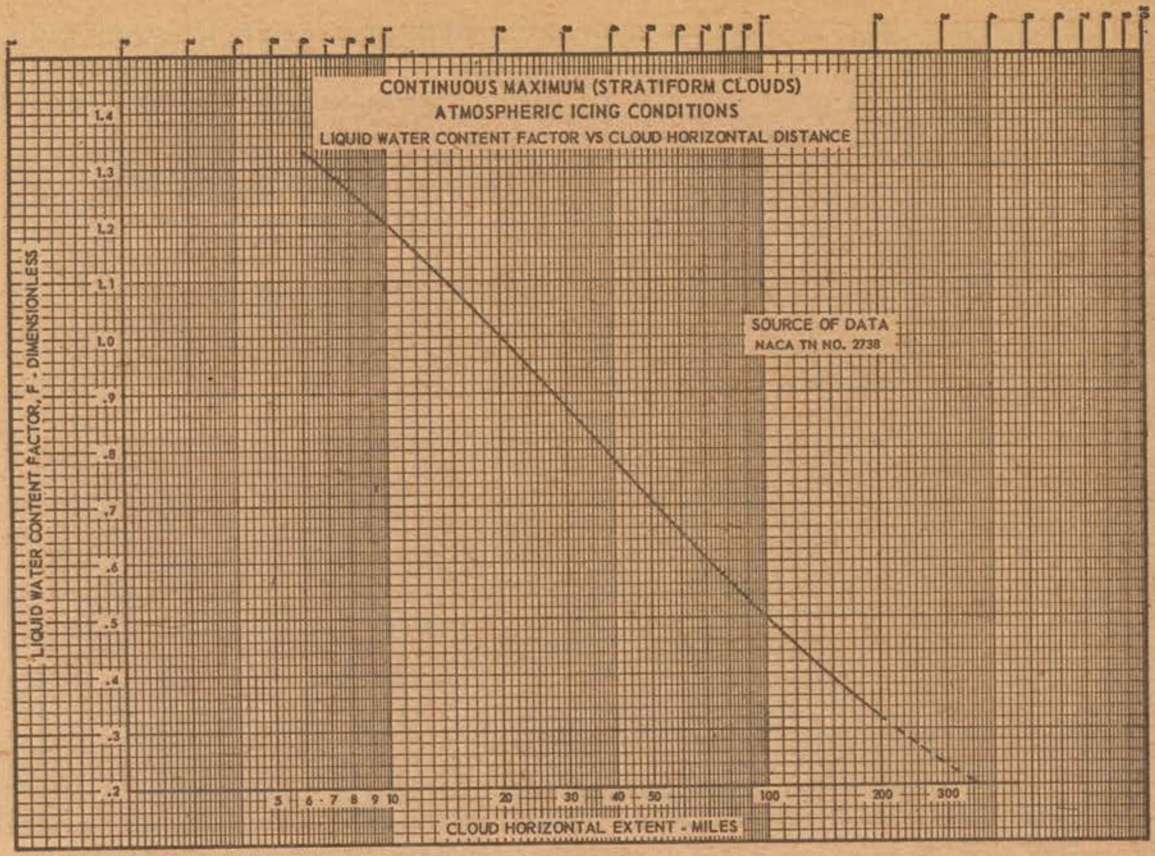


FIGURE 3.

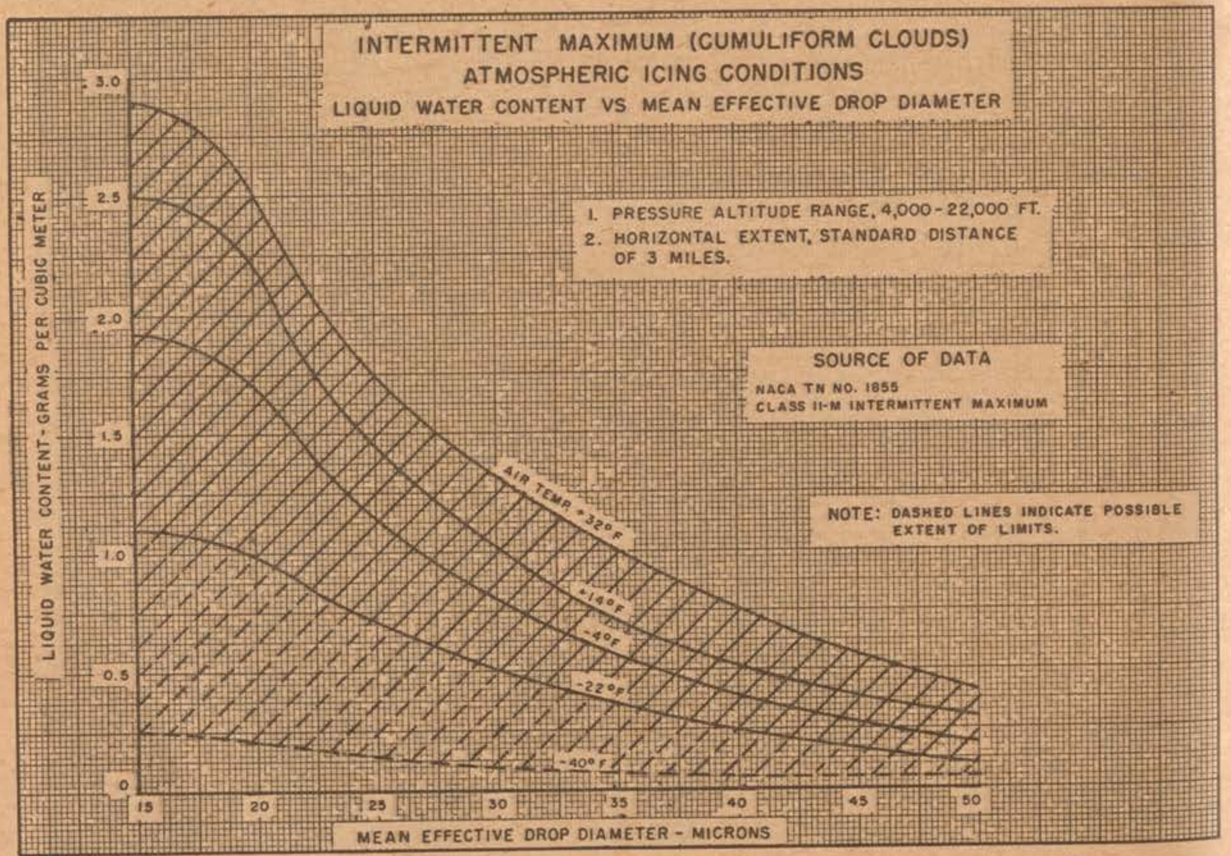


FIGURE 4.

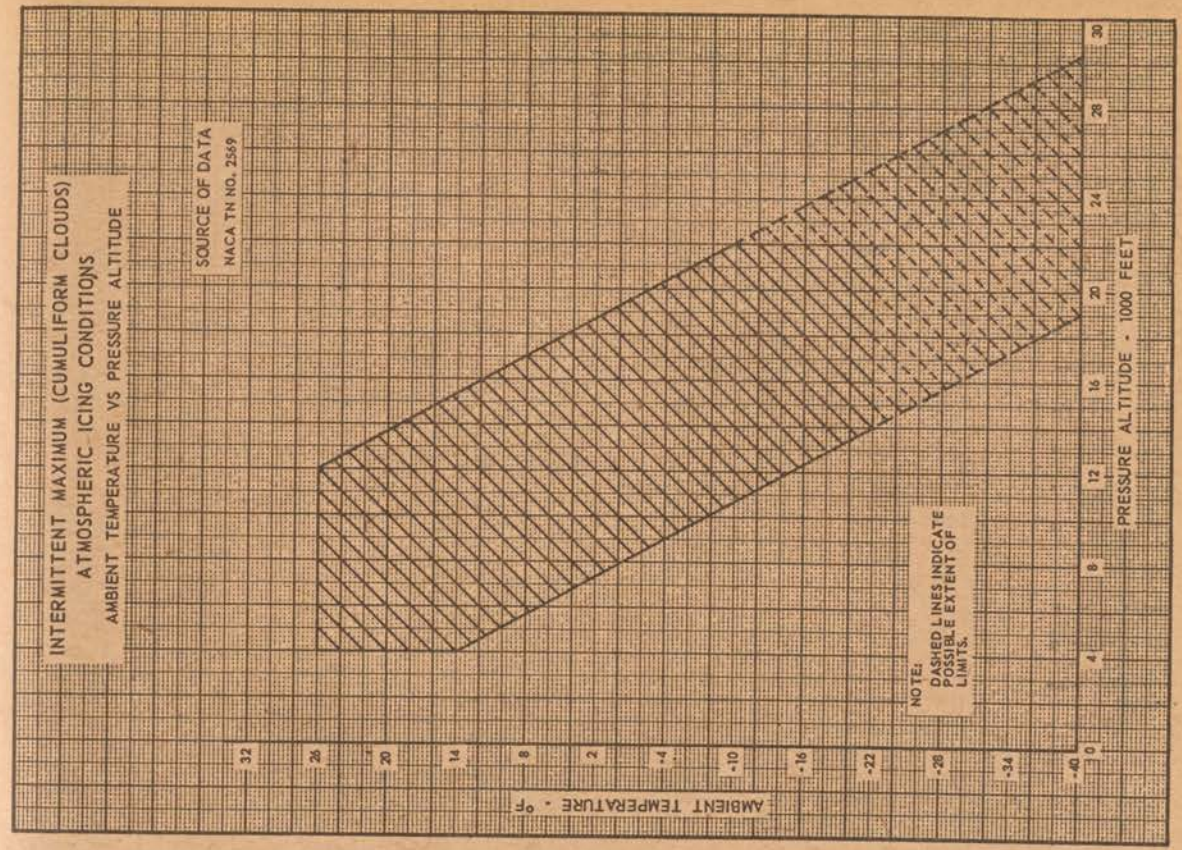


FIGURE 5.

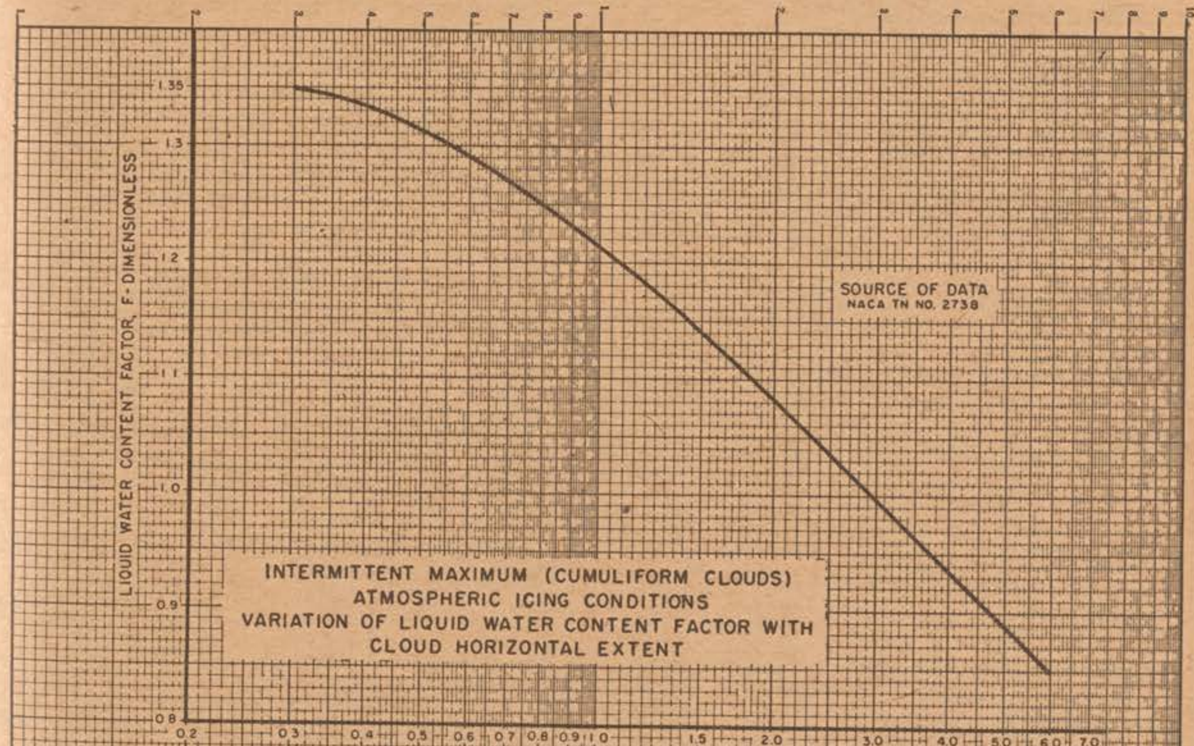


FIGURE 6.

Distribution Table

Present section	*Revised section*
4b.0	25.1.
4b.1	Transferred to Part 1 [New] or executed.
4b.10	Transferred to Part 21 [New].
4b.10–1	Transferred to Part 21 [New].
4b.10–2	Transferred to Part 21 [New].
4b.10–3	Transferred to Part 21 [New].
4b.11	Transferred to Part 21 [New].
4b.12	Transferred to Part 21 [New].
4b.13	Transferred to Part 21 [New].
4b.14	Transferred to Part 21 [New].
4b.15	Transferred to Part 21 [New].
4b.16	Transferred to Part 21 [New].
4b.16–1	Transferred to Part 21 [New].
4b.16–2	Transferred to Part 21 [New].
4b.16–3	Transferred to Part 21 [New].
4b.16–4	Transferred to Part 21 [New].
4b.17	Transferred to Part 21 [New].
4b.18	Transferred to Part 21 [New].
4b.18–1	Transferred to Part 21 [New].
4b.18–2	Transferred to Part 21 [New].
4b.18–3	Transferred to Part 21 [New].
4b.18–4	Transferred to Part 21 [New].
4b.19	Transferred to Part 21 [New].
4b.100 (less (d)–(g))	25.11.
4b.100 (d)–(g)	Transferred to Part 21 [New].
4b.100–1 (less 1st sentence of (b)(1)).	Not a rule.
4b.100–1 (1st sentence of (b)(1)).	25.11.
4b.100–1 (less (b)(2))	Not a rule.
4b.100–1(b)(2)	25.11.
4b.100–2	Not a rule.
4b.100–3 (less 1st sentence).	Not a rule.
4b.100–3 (1st sentence)	25.11.
4b.101	25.13.
4b.102	25.15.
4b.103	25.17.
4b.104	25.19.
4b.105	25.21.
4b.105–1	Not a rule.
4b.110	25.33.
4b.110–1 (less (a))	Not a rule.
4b.110–1(a)	25.33.
4b.110–2	Not a rule.
4b.111	25.35.
4b.111–1	Not a rule.
4b.112	25.37.
4b.112–1	Not a rule.
4b.113	25.39.
4b.113–1	Not a rule.
4b.113–2	Not a rule.
4b.114	25.41.
4b.114–1	Not a rule.
4b.115	25.43.
4b.115–1	Not a rule.
4b.115–2	Not a rule.
4b.115–3	Not a rule.
4b.115–4	Not a rule.
4b.116	25.45.
4b.116–1	25.45.
4b.116–2	Not a rule.
4b.117	25.47.
4b.118	Surplusage.
4b.118–1	Not a rule.
4b.119	25.49.
4b.119–1	Not a rule.
4b.120	25.51.
4b.120–1	25.51.
4b.120–2	Not a rule.
4b.121	25.53.
4b.121–1	Not a rule.
4b.122	25.55.
4b.122–1	Not a rule.
4b.122–2	Not a rule.
4b.122–3	Not a rule.
4b.122–4	Not a rule.
4b.123	25.55.
4b.123–1	25.55.
4b.123–2	Not a rule.
4b.123–3	Not a rule.
4b.123–4	Not a rule.
4b.124	25.55.
4b.124–1	Not a rule.
4b.125	25.55.
4b.125–1	Not a rule.
4b.130	25.101.
4b.130–1	Not a rule.
4b.131	25.103.
4b.131–1	Not a rule.
4b.132	25.105.
4b.132–1	Not a rule.
4b.133	25.107.
4b.133–1	Not a rule.
4b.140	25.111.
4b.140–1	Not a rule.
4b.141	25.111.
4b.141–1	Not a rule.
4b.142	25.111.
4b.142–1	Not a rule.
4b.143	25.111.
4b.143–1	Not a rule.
4b.144	25.111.
4b.144–1	Not a rule.
4b.150	25.121.
4b.151	25.123.
4b.152	25.125.
4b.153	25.127.
4b.154	25.129.
4b.155	25.131.
4b.156	25.133.
4b.156–1	Not a rule.
4b.157	25.135.
4b.157–1	Not a rule.
4b.158	25.133.
4b.158–1	Not a rule.
4b.160	25.141.
4b.160–1	Not a rule.
4b.161	25.143.
4b.161–1	Not a rule.
4b.162	25.145.
4b.162–1 (less last sentence).	Not a rule.
4b.162–1 (last sentence).	25.145.
4b.170	25.151.
4b.170–1	Not a rule.
4b.170–2	Not a rule.
4b.170–3	Not a rule.
4b.171	25.153.
4b.171–1	25.153.
4b.171–2	Not a rule.
4b.171–3	Not a rule.
4b.172	25.155.
4b.172–1	Not a rule.
4b.173	25.157.
4b.173–1	Not a rule.
4b.173–2	Not a rule.
4b.180	25.161.
4b.180–1	Not a rule.
4b.181	25.163.
4b.181–1	Not a rule.
4b.182	25.165.
4b.182–1	Not a rule.
4b.182–2	Not a rule.
4b.190	25.171.
4b.190–1	Not a rule.
4b.191	25.173.
4b.200 (less (a))	25.191.
4b.200(a)	25.193.
4b.201	25.195.
4b.202	25.197.
4b.210 (less (b) and (c)).	25.201.
4b.210(b)	25.203.
4b.210(c)	25.205.
4b.211 (less (a) and (b)).	25.207.
4b.211(a)	25.209.
4b.211(b)	25.211.
4b.212	25.213.
4b.213	25.215.
4b.214	25.217.
4b.215	25.219.
4b.216 (less (b)–(e))	25.221.
4b.216(b)	25.223.
4b.216(c)	25.225.
4b.216(d)	25.227.
4b.216(e)	25.229.
4b.217	25.231.
4b.220	25.241.
4b.221	25.243.
4b.222	25.245.
4b.223	25.247.
4b.224 (less last two sentences of (a)).	25.249.
4b.224 (last two sentences of (a)).	25.255.
4b.225	25.251.
4b.226	25.253.
4b.227	25.257.
4b.230	25.261.
4b.231	25.263.
4b.232	25.265.
4b.233	25.267.
4b.234	25.269.
4b.234a	25.271.
4b.235 (intro. para.) (less last sentence).	25.281.
4b.235 (intro. para.) (last sentence).	25.285 and 25.291.
4b.235(a)	25.283.
4b.235(b)	25.285.
4b.235(c)	25.287.
4b.235(d)	25.289.
4b.235(e)	25.291.
4b.235(f)	25.293.
4b.235(g)	25.295.
4b.235 (less intro. para. and (a) through (g)).	25.297.
4b.236	25.301.
4b.250	25.311.
4b.250–1	25.311.
4b.251	25.313.
4b.252	25.315.
4b.253	25.317.
4b.254	25.319.
4b.255	25.321.
4b.256	25.323.
4b.257	25.325.
4b.258	25.327.
4b.260	25.331.
4b.261	25.333.
4b.270	25.341.
4b.270–1	25.341.
4b.270–2	Not a rule.
4b.271	25.343.
4b.300	25.391.
4b.300–1	Not a rule.
4b.301	25.393.
4b.301–1 (less 1st sentence).	Not a rule.
4b.301–1 (1st sentence)	25.393.
4b.302	25.395.
4b.303	25.397.
4b.304	25.399.
4b.305	25.401.
4b.306	25.403.
4b.306–1 (less (c))	25.403.
4b.306–1(c)	Not a rule.
4b.307 (less (a)–(c))	25.405.
4b.307(a)	25.407.
4b.307(b)	25.409.
4b.307(c)	25.411.
4b.308	25.413.
4b.310	Surplusage.
4b.311	25.421.
4b.312	25.423.
4b.313	25.425.
4b.320	25.431.
4b.321	25.433.
4b.322	25.435.
4b.323	25.437.

Present section	*Revised section*
4b.324	25.439.
4b.324–1	Not a rule.
4b.325	25.441.
4b.326	25.443.
4b.327	25.445.
4b.328	25.447.
4b.329 less (a) and (b)).	25.451.
4b.329(a)	25.453.
4b.329(b)	25.455.
4b.329–1	Not a rule.
4b.329–2	Not a rule.
4b.329–3	Not a rule.
4b.329–4	Not a rule.
4b.329–5	Not a rule.
4b.329–6	25.455.
4b.330	25.461.
4b.331	25.461.
4b.332 (intro. paragraph).	25.461.
4b.332 (less intro. paragraph, (a), and (b)).	25.467.
4b.332(a)	25.463.
4b.332(b)	25.465.
4b.333	25.469
4b.334	25.471.
4b.334–1	Not a rule.
4b.334–2	25.471.
4b.335	25.473.
4b.336	25.475.
4b.337	25.477.
4b.337–1	Not a rule.
4b.337–2	Not a rule.
4b.337–3	Not a rule.
4b.337–4 (less 1st sentence).	Not a rule.
4b.337–4 (1st sentence)	25.477.
4b.338	25.479.
4b.340	Surplusage.
4b.341	25.491.
4b.342	25.493.
4b.350	25.501.
4b.350–1	Not a rule.
4b.351	25.503.
4b.351–1	Not a rule.
4b.351–2	Not a rule.
4b.351–3	Not a rule.
4b.352	25.505.
4b.353	25.507.
4b.353–1	Not a rule.
4b.354	Surplusage.
4b.355	Surplusage.
4b.356	25.517.
4b.356–1 (less last sentence).	Not a rule.
4b.356–1 (last sentence).	25.517.
4b.356–2 (less 1st sentence).	Not a rule.
4b.356–2 (1st sentence)	25.517.
4b.356–3	Not a rule.
4b.356–4	Not a rule.
4b.356–5	Not a rule.
4b.356–6	Not a rule.
4b.358	25.519.
4b.358–1 (less 2d and 3d sentences).	Not a rule.
4b.358–1 (2d and 3d sentences).	25.519.
4b.359	25.521.
4b.360	Surplusage.
4b.361	25.531.
4b.362 (introductory paragraph).	25.533.
4b.362(a)	25.535.
4b.362(b)	25.537.
4b.362(c)	25.539.
4b.362(d)	25.541.
4b.362(e)	25.543.
4b.362(f)	25.545.
4b.362(g)	25.547.
4b.362 (less intro. para. and (a) through (g)).	25.549.
4b.362–1 (less (a))	25.543 and 25.545.
4b.362–1(a)	25.535.
4b.362–2	25.537.
4b.362–3 (less (a))	25.539.
4b.362–3(a)	Surplusage.
4b.362–4	25.543.
4b.362–5 (less (c))	25.545.
4b.362–5	Not a rule.
4b.362–6	Not a rule.
4b.362–7	Not a rule.
4b.370	Surplusage.
4b.371	25.561.
4b.371–1	25.561.
4b.372	25.563.
4b.372–1	Not a rule.
4b.373	Surplusage.
4b.374	25.567.
4b.375	25.569.
4b.375–1	25.569.
4b.376	25.571.
4b.380	25.581
4b.380–1	Not a rule.
4b.380–2	Not a rule.
4b.381	25.583.
4b.381–1	Not a rule.
4b.382	25.585.
4b.383 (less 2d sentence of (a) and (b)(3)).	25.587.
4b.383 (2d sentence of (a) and (b)(3)).	25.581.
4b.384	25.589.
4b.384–1	Not a rule.
4b.385	25.591.
4b.386	25.593.
4b.390	25.601.
4b.391	25.603.
4b.400	25.641.
4b.400–1	Not a rule.
4b.400–2	25.641.
4b.401	25.643.
4b.401–1	Not a rule.
4b.401–2	Not a rule.
4b.401–3	Not a rule.
4b.401–4	Not a rule.
4b.402	25.645.
4b.402–1	Not a rule.
4b.403	25.647.
4b.404	25.649.
4b.405	25.651.
4b.406	25.653.
4b.406–1	Not a rule.
4b.407	25.655.
4b.407–1 (less 1st sentence of (b) and (c)).	25.655.
4b.407–1 (1st sentence of (b) and (c)).	Not a rule.
4b.408	25.657.
4b.409	25.659.
4b.410	25.671.
4b.411	25.673.
4b.413	25.675.
4b.416	25.677.
4b.417	25.679.
4b.417–1	Not a rule.
4b.418	25.681.
4b.420	25.691.
4b.420–1	Not a rule.
4b.421	25.693.
4b.422	25.695.
4b.423	25.697.
4b.424	25.699.
4b.425	25.701.
4b.426 (less (a))	25.705.
4b.426(a)	25.703.
4b.427	25.707.
4b.428	25.709.
4b.430	25.721.
4b.430–1	25.721.
4b.432	25.723.
4b.433	25.725.
4b.434	25.727.
4b.435	25.729.
4b.436	25.731.
4b.437	25.733.
4b.437–1	Not a rule.
4b.440	25.741.
4b.441(a)	25.743.
4b.441(b)	25.745.
4b.441(c)	25.747.
4b.441(d)	25.749.
4b.441 (less (a)–(d))	25.751.
4b.442	25.753.
4b.443	25.755.
4b.444	25.757.
4b.445	25.759.
4b.446	25.761.
4b.447	25.763.
4b.448	25.765.
4b.449	25.767.
4b.449–1	25.767.
4b.450	25.781.
4b.451(a)	25.783.
4b.451 (less (a))	25.785.
4b.452	25.787.
4b.454	25.789.
4b.460	25.801.
4b.461	25.803.
4b.461–1	Not a rule.
4b.462	28.805.
4b.463	25.807.
4b.464	25.809.
4b.466	25.811.
4b.467(a)	25.821.
4b.467(b)	25.823.
4b.467(c)	25.825.
4b.467(d)	25.827.
4b.467 (less (a)–(d))	25.829.
4b.467–1 (less 1st sentence).	Not a rule.
4b.467–1 (1st sentence)	25.561 and 25.821.
4b.467–2	Not a rule.
4b.470	25.841.
4b.471 (less (c))	25.843.
4b.471(c)	25.845.
4b.472	25.847.
4b.473	25.849.
4b.474(a)	25.851.
4b.474 (less (a))	25.853.
4b.474–1	Not a rule.
4b.474a	25.855.
4b.475	25.857.
4b.476	25.859.
4b.476a	25.861.
4b.477	25.863.
4b.478	25.865.
4b.480	25.871.
4b.481	25.873.
4b.482	25.875.
4b.483	25.877.
4b.484(a)	25.879.
4b.484(b)	25.881.
4b.484(c)	25.883.
4b.484(d)	25.883.
4b.484 (less (a)–(d))	25.885.
4b.484–1 (less 18th–30th words of para. (a) and subparagraphs (a)(1) and (2)).	Not a rule.
4b.484–1 (18th – 30th words of paragraph (a) and subparagraphs (a)(1) and (2)).	25.881.
4b.485	25.887.
4b.485–1	Not a rule.
4b.486	25.889.
4b.487	25.891.
4b.489	25.893.
4b.490	25.895.
4b.600	25.941.
4b.601	25.941.
4b.602	25.941.
4b.603	25.943.
4b.604	25.945.
4b.605	25.947.
4b.606	25.949.
4b.606–1	Not a rule.
4b.606–2	Not a rule.
4b.610	25.961.
4b.611	25.961.
4b.611–1	Not a rule.
4b.612(a)	25.963.
4b.612(b)	25.965.
4b.612(c)	25.967.
4b.612(d)	25.969.
4b.612(e)	25.971.
4b.612 (less (a)–(c))	25.973.
4b.612–1	Not a rule.
4b.612–2	Not a rule.
4b.612–3	Not a rule.
4b.612–4	Not a rule.
4b.612–5	Not a rule.
4b.613(a)	25.975.
4b.613(b)	25.977.

Present section	*Revised section*
4b.613(c)	25.979.
4b.613(d)	25.981.
4b.613(e)	25.983.
4b.613 (less (a)-(e))	25.985.
4b.620	Surplus.
4b.621	25.1001.
4b.622	25.1003.
4b.622-1	Not a rule.
4b.623	25.1005.
4b.624	25.1007.
4b.624-1 (first sentence).	Not a rule.
4b.624-1 (less first sentence).	25.1007.
4b.625	25.1009.
4b.625-1 (intro. paragraph) (1st sentence).	25.1009.
4b.625-1 (less intro. paragraph) (1st sentence).	Not a rule.
4b.626	25.1011.
4b.626-1 (1st sentence)	25.1011.
4b.626-1 (footnote 46)	25.1011.
4b.626-1 (less 1st sentence and footnote 46).	Not a rule.
4b.627	25.1013.
4b.628	25.1015.
4b.630	25.1021.
4b.631	25.1023.
4b.632	25.1025.
4b.632-1 (1st sentence).	25.1025.
4b.632-1 (less 1st sentence).	Not a rule.
4b.633	25.1027.
4b.634	25.1029.
4b.634-1	25.1029.
4b.635	25.1037.
4b.636	25.1039.
4b.637	25.1041.
4b.640	25.1051.
4b.641	Surplusage.
4b.642	25.1055.
4b.642-1	Not a rule.
4b.643	25.1057.
4b.644	25.1059.
4b.645 (less (e))	25.1061.
4b.645(e)	25.1063.
4b.646	25.1063.
4b.647	25.1061.
4b.650	25.1071.
4b.651(a)	25.1073.
4b.651(b)	25.1075.
4b.651(c)	25.1077.
4b.651(d)	25.1079.
4b.651(e)	25.1081.
4b.651(f)	25.1083.
4b.651(g)	25.1085.
4b.651 (less (a)-(g))	25.1087.
4b.651-1	Not a rule.
4b.651-2(c)	25.1087.
4b.651-2 (less (c))	Not a rule.
4b.651-3	Not a rule.
4b.651-4	Not a rule.
4b.651-5(a)	25.1077.
4b.651-5 (less (a))	Not a rule.
4b.651-6	Not a rule.
4b.651-7	Not a rule.
4b.651-8	Not a rule.
4b.651-9	Not a rule.
4b.651-10	Not a rule.
4b.651-11	Not a rule.
4b.651-12	Not a rule.
4b.653	25.1089.
4b.654	25.1091.
4b.655	25.1093.
4b.658	25.1095.
4b.660	25.1097.
4b.700	25.1141.
4b.700-1	Not a rule.
4b.710	25.1151.
4b.711	25.1153.
4b.713	25.1155.
4b.714	25.1157.
4b.715	25.1159.
4b.716	25.1161.
4b.717	25.1163.
4b.718	25.1165.
4b.718-1	Not a rule.
4b.719	25.1167.
4b.720	25.1169.
4b.721	25.1171.
4b.722	25.1173.
4b.723	25.1175.
4b.730	25.1191.
4b.730-1	Not a rule.
4b.731	25.1193.
4b.732	25.1195.
4b.733	25.1197.
4b.734	25.1199.
4b.735	25.1201.
4b.736	25.1203.
4b.737	25.1205.
4b.738(a)	25.1207.
4b.738(b)	25.1209.
4b.738(c)	25.1211.
4b.738(d)	25.1213.
4b.738 (less (a)-(d))	25.1215.
4b.740	25.1221.
4b.740-1	Not a rule.
4b.740-2	Not a rule.
4b.741	25.1223.
4b.742	25.1225.
4b.743	25.1227.
4b.750	Transferred to Part 45 [New].
4b.751	Transferred to Part 45 [New].
4b-1	Not a rule.
4b-2	25.207.
4b-3	25.207.
4b-4	25.253.
4b-5	25.255.
4b-6	25.257.
4b-7	Fig. 1 of Appendix A.
4b-8	Fig. 2 of Appendix A.
4b-9	Fig. 3 of Appendix A.
4b-10	Fig. 4 of Appendix A.
4b-11	Fig. 5 of Appendix A.
4b-12	Fig. 6 of Appendix A.
4b-13	Fig. 7 of Appendix A.
4b-14	Fig. 8 of Appendix A.
4b-15a	Fig. 1 of Appendix B.
4b-15b	Fig. 2 of Appendix B.
4b-15c	Fig. 3 of Appendix B.
4b-16	25.509.
4b-17	25.509.
4b-18	25.1031.
4b-19	25.1033.
4b-20	25.1035.
4b-21	Previously deleted.
4b-22	25.511.
4b-23	Previously deleted.
4b-24a	Fig. 1 of Appendix C.
4b-24b	Fig. 2 of Appendix C.
4b-24c	Fig. 3 of Appendix C.
4b-25a	Fig. 4 of Appendix C.
4b-25b	Fig. 5 of Appendix C.
4b.25c	Fig. 6 of Appendix C.
4b-26	25.297.
4b-27	25.1041(d)(1).
SR 422B:	
Item 1	Surplusage.
Item 2, comprised of a intro. paragraph, §§ 4T.110-4T.123, and § 4T.743, distributed as follows:	
Intro. paragraph	25.63.
4T.110(a)	25.1229.
4T.110 (less (a))	25.63.
4T.111	25.65.
4T.112(a) and (b)	25.67.
4T.112 (less (a) and (b)).	25.69
4T.113	25.71.
4T.114	25.73.
4T.115	25.75.
4T.116	25.77.
4T.117	25.79.
4T.117a	25.81.
4T.118	25.83.
4T.119	25.85.
4T.120	25.87.
4T.121	25.89.
4T.122	25.91.
4T.123(a)	25.1177.
4T.123 (less (a))	25.1229.
4T.743(a)	25.1223.
4T.743 (less (a))	25.1229.
Item 3	Trfd. to Parts 123, 125, and 127 [New].
Item 4	Trfd. to Part 91 [New].
SR 422B (less items 1-4), distributed as follows:	
Item 5(a)	25.79.
Less Item 5(a)	25.75.

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